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To: [FOIA Exemption (b)(6)] SAJ
Cc: daniel_paganrosa@yahoo.com; andrewgoetz@bcpeabody.com; [FOIA Exemption (b)(6)] SAJ;
johannawillis@bcpeabody.com; johnhall@bcpeabody.com; KenCaraccia@bcpeabody.com; [FOIA Exemption (b)(6)] SAJ
Subject: RE: Copy of Gaseducto Del Sur (GDS) BA and permit (UNCLASSIFIED)
Date: Wednesday, February 23, 2011 5:30:32 PM

Thank you very much for the .pdf file [FOIA Exemption (b)(6)]. My apologies if there was any confusion ... we wanted to ask the Corps for the information so we were sure we had the correct file (especially given the interest USFWS has). Your support is very much appreciated and, hopefully, it didn't take too long to scan the documents.

We are looking forward to the next PDT meeting.

Best regards.

Lawrence C. Evans
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From: [FOIA Exemption (b)(6)] SAJ <[FOIA Exemption (b)(6)]@usace.army.mil>
Sent: Wednesday, February 23, 2011 2:20 PM
To: LarryEvans@bcpeabody.com
Subject: RE: Copy of Gaseducto Del Sur (GDS) BA and permit (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

Larry,

As I understood on following emails you would get the BA from the proponent (PREPA). The documents was not in PDF, however I spent the time to scan the document and convert it to PDF.

The document is not in color and it does not contain other pages that were in 11x17 which our equipment is no capable of scanning.

Please check with PREPA's files on the gasoducto del Sur if you need the color version with the maps.

Respectfully,

[FOIA Exemption (b)(6)]
Project Manager
Antilles Regulatory Section

-----Original Message-----

From: LarryEvans@bcpeabody.com [<mailto:LarryEvans@bcpeabody.com>]
Sent: Wednesday, February 23, 2011 1:27 PM
To: [FOIA Exemption (b)(6)] SAJ
Cc: andrewgoetz@bcpeabody.com; [FOIA Exemption (b)(6)] SAJ;
johannawillis@bcpeabody.com; johnhall@bcpeabody.com;

KenCaraccia@bcpeabody.com
Subject: Copy of Gaseducto Del Sur (GDS) BA and permit
Importance: High

Good morning FOIA Exempt -

A while back I had asked if we could get a copy of the GDS permit and (more importantly) the BA (since USFWS has encouraged us to sue that BA as a model for the Via Verde project). I haven't heard anything back from you and I was wondering when you could send me the documents?

If it is available electronically (perhaps a .pdf) that would be great!

Please let me know when we might be able to receive this information since we are preparing to move forward shortly and append the Biological Evaluation we previously sent to the Corps with the permit application.

Best regards!

Lawrence C. Evans
503.781.7930 (cell)
larryevans@bcpeabody.com
iyutka53@aol.com

Classification: UNCLASSIFIED
Caveats: NONE

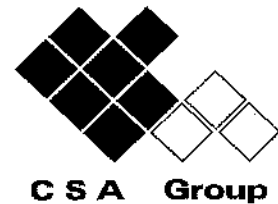
**ATTACHMENT 6
BIOLOGICAL ASSESSMENT**

USACE#: SAJ-2006-7931 (IP-DD)
BIOLOGICAL ASSESSMENT
“GASODUCTO DEL SUR”

Prepared for
Puerto Rico Electric Power Authority



Prepared by
CSA Architects and Engineers, LLP.



FEBRUARY 2008



Table of Contents

1.0	Introduction	5
1.1.	Overview of the Biological Assessment	5
1.2.	Purpose of the Biological Assessment.....	6
1.3.	Project Purpose and Need	7
1.4.	Description of Existing Conditions	8
1.4.1.	Project Description	10
2.0	Alternatives for the Propose Project	12
2.1.1.	No Action	12
2.1.2.	Terrestrial Routes	15
2.1.3.	Marine Routes.....	17
2.1.3.1.	Impact to natural systems	18
2.1.4.	Port or Import Terminal	20
2.1.4.1.	Evaluation Criteria.....	21
2.1.4.2.	Maritime operations.....	21
2.1.4.3.	Environmental Issues	21
3.0	Impact Assessment	23
4.0	Species Account	26
4.1.	Wildlife	26
4.1.1.	Puerto Rican Nightjar (<i>Caprimulgus noctitherus</i>)	26
4.1.1.1.	General Species Biology	26
4.1.1.2.	Distribution and Abundance	27
4.1.1.3.	Current Conditions.....	28
4.1.1.4.	Summary of Impacts	29
4.1.1.5.	Indirect, Interdependent, Interrelated and Cumulative Effects	30
4.1.1.6.	Conservation Measures and Recommendations	30
4.1.1.7.	Conclusion	31
4.1.2.	Yellow-shouldered Black Bird (<i>Agelaius xanthomus</i>)	31
4.1.2.1.	General Species Biology	31
4.1.2.2.	Distribution and Abundance	32
4.1.2.3.	Current Conditions.....	33
4.1.2.4.	Summary of Impacts	33
4.1.2.5.	Indirect, Interdependent, Interrelated and Cumulative Effects	33
4.1.2.6.	Conservation Measures and Recommendations.....	34
4.1.2.7.	Conclusion	34
4.1.3.	Puerto Rican Plain Pigeon (<i>Patagioenas inornata wetmorei</i>)	34
4.1.3.1.	General Species Biology	34
4.1.3.2.	Distribution and Abundance.....	35
4.1.3.3.	Current Conditions.....	35
4.1.3.4.	Summary of Impacts	36
4.1.3.5.	Indirect, Interdependent, Interrelated and Cumulative Effects	36
4.1.3.6.	Conservation Measures and Recommendations	36

4.1.3.7.	Conclusion	36
4.1.4.	Brown Pelican (<i>Pelecanus occidentalis occidentalis</i>)	36
4.1.4.1.	General Species Biology	36
4.1.4.2.	Distribution and Abundance	37
4.1.4.3.	Current Conditions	37
4.1.4.4.	Summary of Impacts	37
4.1.4.5.	Indirect, Interdependent, Interrelated and Cumulative Effects	37
4.1.4.6.	Conservation Measures and Recommendations	37
4.1.4.7.	Conclusion	37
4.2.	Vegetation	38
4.2.1.	Vahl's boxwood (<i>Buxus vahlii</i> Baill.)	38
4.2.1.1.	General Species Biology	38
4.2.1.2.	Distribution and Abundance	38
4.2.1.3.	Current Conditions	38
4.2.1.4.	Summary of Impacts	38
4.2.1.5.	Indirect, Interdependent, Interrelated and Cumulative Effects	39
4.2.1.6.	Conservation Measures and Recommendations	39
4.2.1.7.	Conclusion	39
4.2.2.	Bariaco (<i>Trichilia triacantha</i> Urban)	40
4.2.2.1.	General Species Biology	40
4.2.2.2.	Distribution and Abundance	40
4.2.2.3.	Current Conditions	41
4.2.2.4.	Summary of Impacts	42
4.2.2.5.	Indirect, Interdependent, Interrelated and Cumulative Effects	42
4.2.2.6.	Conservation Measures and Recommendations	42
4.2.2.7.	Conclusion	42
4.2.3.	<i>Cordia rupicola</i> Urban	43
4.2.3.1.	General Species Biology	43
4.2.3.2.	Distribution and Abundance	43
4.2.3.3.	Current Conditions	44
4.2.3.4.	Summary of Impacts	44
4.2.3.5.	Indirect, Interdependent, Interrelated and Cumulative Effect	44
4.2.3.6.	Conservation Measures and Recommendations	44
4.2.3.7.	Conclusion	44
4.2.4.	<i>Eugenia woodburyana</i> Alain	44
4.2.4.1.	General Species Biology	44
4.2.4.2.	Distribution and Abundance	45
4.2.4.3.	Current Conditions	45
4.2.4.4.	Summary of Impacts	45
4.2.4.5.	Indirect, Interdependent, Interrelated and Cumulative Effect	45
4.2.4.6.	Conservation Measures and Recommendations	46
4.2.4.7.	Conclusion	46
5.0	Conclusion and General Recommendations	47
6.0	Cited Literature	51
Appendix 1	54
Appendix 2	58

Appendix 3.....	59
Appendix 4.....	61

List of Tables

Table 1: Increment on cost of Petroleum and Diesel from years 1990 to 2005. MBBO means Millions of Barrels of Oil Equivalent and BBL means Billions of Barrels of Oil equivalents.	15
Table 2: Evaluation matrix for route selection.....	17
Table 3. Federally Listed Threatened and Endangered Species Analyzed for the Biological Assessment.....	24
Table 4. General Overview of Threatened and Endangered Species Evaluated in the Biological Assessment.....	25

1.0 Introduction

Section 7 of the Endangered Species Act of 1973 (ESA) directs all Federal Agencies to utilize their existing authorities to conserve threatened and endangered species. It also requires that, in consultation with the United States Fish and Wildlife Service (USFWS, the Service), Federal agencies ensure that any action, authorized, funded or carried out by the agency, does not jeopardize the continued existence of federally listed endangered or threatened species, or destroy or adversely modify their designated critical habitat. Federal regulations require the preparation of a Biological Assessment if any listed species or a critical habitat may be present in an area to be impacted by a "major construction activity". This is defined as a construction project involving a major Federal action significantly affecting the quality of the human environment, as referred to in the National Environmental Policy Act (NEPA, 1969).

1.1. Overview of the Biological Assessment

This Biological Assessment (BA) was prepared by CSA Architects and Engineers, LLP for the Puerto Rico Electric Power Authority (PREPA, also the Applicant) in response to a request from the Antilles Office, Jacksonville District, U.S. Army Corps of Engineers (Corps), and in compliance with Section 7 of the ESA. The BA pertains to the proposed development of the "Gasoducto Del Sur" (GDS or the Project) an underground gaseoduct in the southern region of Puerto Rico that is an initiative for fuel diversification in the process of generating electricity. PREPA is proposing the construction of a 42.4-mile, 20" diameter steel pipe gaseoduct in southern Puerto Rico along the municipalities of Peñuelas, Ponce, Juana Díaz, Santa Isabel and Salinas to supply natural gas from the Peñuelas' Ecoeléctrica Cogeneration Plant, to the Combined Cycle Plant (CCP) in Salinas. The Corps acts as the sponsor of the GDS, while PREPA, an agency of the Government of Puerto Rico (GPR), acts as the Applicant for the required federal permits and endorsements for the development of the GDS.

A series of pre-application meetings were held by PREPA with the Federal Agencies to present the Project:

- US Army Corps of Engineers – November 2, 2005 and September 6, 2006; December 12, 2007 and January 17, 2008.

- US Fish and Wildlife Service – March 10, 2006 and April 25, 2006 and January 23, 2008

Also, on October 2, 2007 PREPA and their consultant biologists from CSA Architects and Engineers, LLP, conducted a field visit with the USFWS and the Department of Natural and Environmental Resources (DNER) to the areas where the endangered species were identified. Following this visit the USFWS sent a letter as follow-up to the issues discussed with Service biologist Marelisa Rivera and to continue providing technical assistance to PREPA for the Section 7 consultation a part of the permitting process with U.S. Corps of Engineers.

This BA was prepared by CSA Architects and Engineers, LLP for PREPA as part of the Joint Permit Application (JP) evaluation process to comply with the requirements of Section 7 (a) (2) of the ESA.

1.2. Purpose of the Biological Assessment

As cited in the Endangered Species Act (ESA) under provisions of Section 7 (a) (2), "Each Federal agency shall, in consultation with and with the assistance of the Secretary, insure that any action authorized, funded, or carried out by such agency (hereinafter in this section referred to as an "agency action" is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined by the Secretary, after consultation as appropriate with affected States, to be critical, unless such agency has been granted an exemption for such action by the Committee pursuant to subsection (h) of this section. In fulfilling the requirements of this paragraph each agency shall use the best scientific and commercial data available."

The same process also applies to the National Marine Fisheries Service (NMFS) and the species under their jurisdiction. A Biological Assessment must be prepared if listed species or their critical habitat may be present in the area to be impacted by a "major construction activity". A major construction activity is defined as any construction project involving a Federal action significantly affecting the quality of the human environment as described in the NEPA. Projects that include a major construction activity under NEPA require the preparation and submittal of a BA.

The GDS would be considered as a major construction project, and must comply with the BA requirement. The purpose of this BA is to identify any threatened or endangered species that could be affected by the construction of the GDS; assess the potential impacts on these species; and identify appropriate conservation measures for the protection of the species and their habitats.

Description of the Proposed Project

1.3. Project Purpose and Need

The Gasoducto Del Sur is a priority project for PREPA in its initiative for fuel diversification in the process of generating electricity. For this reason, PREPA is proposing the construction of a 42.4-mile, 20" diameter steel pipe gaseoduct in southern Puerto Rico along the municipalities of Peñuelas, Ponce, Juana Díaz, Santa Isabel and Salinas to supply natural gas from the Peñuelas' Ecoeléctrica Plant, to the Combined Cycle Plant (CCP) in Salinas. The use of natural gas will provide more efficient operations for PREPA and will help in the management of energy costs, reducing the dependency on petroleum and the environmental impact of atmospheric pollution. The Project will impact private and public lands presently used for commercial, industrial and agricultural purposes. Also, some forested areas and pastures will be directly impacted by the Project construction and operation (See Appendix 1: Aerial Photograph and Figure 2: Topographic maps).

The proposed pipeline will require a 75-foot (with some areas extended to 120-foot wide due to machinery requirements, only at the mountainous area of Peñuelas and Ponce between mile 2.98 and 7.98) wide impact zone along the 42.4-mile extension of the Project (See Appendix 2: Alpha Engineering Plans). The pipeline will require the construction of a trench for a 20" pipeline. An estimated 444.1 acres, approximately, of commercial, industrial, agricultural, forested, and wetland areas will be impacted due to land clearing and excavation activities. PREPA will follow all recommendations made by inherent agencies regarding endangered species, wetland and mangroves protection.

Forty-seven (47) water bodies will be crossed using methods such as Horizontal Direct Drilling (HDD) on all rivers and open trenches for all creeks at the Project site.

The foremost justification for the development of the GDS in Puerto Rico is the need of alternative fuel sources for power generation. The use of natural gas is the most viable option contemplated by PREPA at this moment. Southern Puerto Rico is home to the first natural gas project in the island, the Ecoeléctrica Plant at Peñuelas. Ecoeléctrica is one of six (6) natural gas import terminals in the United States. At present, PREPA is evaluating other energy sources, including

renewable energy sources, but these cannot supply large amount of electric energy to satisfy Puerto Rico's actual energy demand.

1.4. Description of Existing Conditions

The environmental baseline is an analysis of the past and present human and natural factors leading to the current status of listed species or their habitats and ecosystems within the proposed *action area*. For the purposes of this BA, the *action area* is defined as the southern land portion corridor extending approximately 42.4 miles along the municipalities of Peñuelas, Ponce, Juana Díaz, Santa Isabel and Salinas.

The Project is located in one of Puerto Rico's driest ecological life zones, which is classified as Subtropical Dry Forest by Ewel and Whitmore (1973). This region's typical vegetation is mostly xerophytic, that is, deciduous forest with low-height trees and shrubs. The leaves tend to be small, coriaceous, or succulent, with an abundance of thorny species. The vegetation found in the proposed Project areas is typical of a native Subtropical Dry Forest. Much of this land is occupied by a great diversity of plants and animals associated with this ecosystem. The topography in the action area has had a profound effect in its floristic composition which can be divided into different habitats: dwarf subtropical dry forest, semi-open-spiny scrubland and a semi-deciduous dry forest, agricultural lands, herbaceous and forested wetlands, and commercial and urban areas.

Southern Puerto Rico underwent numerous man-made alterations, mainly from the heavy industries established around the area during the decades of 1950 through 1970's. Through all those years, most of the industrial development at the Project area is related to heavy industries of bulk crude oil established around Guayanilla Bay in Peñuelas and Guayanilla. At Salinas, the electrical power production continued being based on using petroleum fuels. The construction of the Aguirre Thermoelectric Complex started in 1975 with the construction on the Aguirre Power Plant with a capacity of 900 Megawatts (MW) and was followed in 1977 by the Combined Cycle Plant with capacity of 592 MW. At Ponce, the Port of the Americas Harbor is the second largest commercial port in Puerto Rico, with capacity to accept the transshipment via post-Panamax class vessels. Also, at the municipalities of Juana Diaz and Santa Isabel, different agricultural activities are being performed and those lands extend for many miles throughout the Project.

In spite of the heavy industrial and agricultural development, some areas remain in a relatively good state and retain valuable forest and, marine and estuarine resources. The forests of this life zone, at least on Puerto Rico, are richer in birds than those at wetter life zones in the island. The zoning classification for the action area between miles 2.98 to 7.98 between Peñuelas and Ponce are not classified, as shown on the F-EIS. In accordance to land use maps of Peñuelas and Ponce, included on the F-EIS, the land between miles 2.98 to 7.98 were classified as forested areas, outdoor recreational uses and some areas have no use assigned.

The *action area* contains forested areas that are known to support and provide habitat to a number of endangered species, especially in the hills north of road PR-2 between Peñuelas and Ponce and dry forest and mangroves around coastal plains along the Project. Among the endangered species that are known to occur or likely to occur in the vicinity of the Project are the Puerto Rican Nightjar, the Brown Pelican, the Yellow-shouldered Blackbird, the Puerto Rican Plain Pigeon, and four plants, Vahl's boxwood, Bariaco, *Eugenia woodburyana* and *Cordia rupicola*.

As result of the field visits to the proposed project area between miles 2.98 to 7.98 the endangered species Vahl's boxwood (*Buxus vahlii*) and Bariaco (*Trichilia triacantha*) were found at the vicinity of the Proposed Project. A total of three (3) individuals of Bariaco and 408 individuals of Vahl's boxwood were identified in the original project ROW of the Proposed Project during field visits on August 20 -23 and September 7, 2007. These findings led to the realignment of the ROW in order to avoid impacting the endangered trees. *Cordia rupicola* and *Eugenia woodburyana* were not found at the Project's right-of-way. *Eugenia woodburyana* was observed at the vicinity of the Project north of Las Cucharas Penitentiary and near PREPA power lines, but not in the proposed Project's ROW.

The Puerto Rican Nightjar (*Caprimulgus noctitherus*) was observed and heard at the Project's ROW during the field visits throughout mile 2.98 to 7.98 during field surveys on February 19-23 and 26, 2007 and additional observations on October 18, 2006 and July 18, August 21 and September 7 of 2007. Data collected during these surveys indicate that approximately 45.5 male Puerto Rican Nightjars inhabit the Project area.

1.4.1. Project Description

The Applicant's Preferred Alternative for the development of the GDS, as proposed by Puerto Rico Electric Power Authority (PREPA), includes the following elements:

The PREPA proposes the construction of the GDS, which would be located in the municipalities of Peñuelas, Ponce, Juana Díaz, Santa Isabel and Salinas. The main components of the proposed Project consist of an underground gaseoduct, two (2) gas flow meters and a Pig (a tool used to provide inspections, measures and cleanings), a Pig Launcher and receiver. Also, the Project includes the installation of valves used to isolate the gaseoduct in case of inspection, repairs or emergencies. The Project will consist of a lineal excavation of a trench impacting 444.1 acres, approximately, of commercial, industrial, agricultural, forested, and wetland areas. The Jurisdictional Wetland Determination Study, additional route changes and site visits determined that 0.34 acres (0.35 cuerdas) will be impacted. The construction of the trench will impact approximately 75 feet of ROW (at the mountainous area of Peñuelas and Ponce between mile 2.98 and 7.98 some areas may require the ROW to be extended to 120-foot wide due to machinery requirements) which includes areas for storage of equipment and materials, pipeline assembly and limited space for transportation vehicles. The permanent operational ROW will be of 50 feet for service, repairs and emergencies.

The GDS will be an underground construction. Public and private lands, currently used for commercial, industrial and of agricultural purposes will be impacted. The pipeline and all other construction materials will be shipped from the United States, and will be received at the Port of the Americas in Ponce and the Port of San Juan. An operations center will be maintained in facilities within the Port of the Americas for storage of materials, equipment and as a meeting area to discuss logistics during construction.

- The project area comprises the following municipalities (see figure 1):
 - *Peñuelas* – The Project begins at the Municipality of Peñuelas, specifically at the Union Carbide property, at road PR-337 Ht. 671, crossing Tallaboa Poniente and

Encarnación Wards until the limits of the Municipality of Ponce. In Peñuelas, the Project will cover approximately 5.4 miles. The construction ROW will be 38.3 acres of which 21.7 acres will be permanent.

- *Ponce* – The Project continues through the Municipality of Ponce, crossing Canas, Playa, Vayas, Bucaná and Capitanejo wards, parallel at the south of road PR-1 at the limits of the Municipality of Juana Diaz. In Ponce the Project extends 13.1 miles with a construction ROW of 146.2 acres of which 79.2 will be permanent.
- *Juana Diaz* – At the Municipality of Juana Diaz, the Project crosses through Sabana Llana, Rio Cañas and Citrona wards, until the vicinities of Santa Isabel, through Descalabrado Ward and Rio Descalabrado. The Project will extend 6.7 miles, approximately. The construction and operation ROW will be of 74.4 and 40.5 acres (permanent impact), respectively.
- *Santa Isabel* – In Santa Isabel, the gaseoduct will cross Descalabrado, Boca Velazquez, Felicia 1, Felicia 2, Jauca 1 and Jauca 2, until the border with Salinas, through Rio Jueyes. The gaseoduct will extend in Santa Isabel, 8.4 miles, approximately. The Project will have a construction and operational ROW of 108.2 and 50.8 acres, respectively.
- *Salinas* - The Project will extend 8.8 miles at the Municipality of Salinas. The Project will cross Rio Jueyes and Aguirre wards. At this municipality the Project will have a construction and operation ROW 96.5 acres and 53.2 acres (permanent impact), respectively. The project ends at the Aguirre Thermolectric Complex, Combined Cycle Plant (CCC).

2.0 Alternatives for the Propose Project

PREPA conducted an analysis of alternatives for the Proposed Project in order to determine the most viable routes. The possible alternatives were discussed with government agencies and a preferred route was selected. The alternatives that are analyzed were: no action; two inland routes, (Alternative A and B, respectively); and a marine route from Eco-Eléctrica in Peñuelas to the CCC. Also the construction of a Port (Import Terminal) was evaluated at Central Aguirre.

2.1.1. No Action

The no action alternative, although considered, was found to be unfeasible given the project's magnitude and importance to the public's well being that the project wants to achieve. If the project is not developed, the following impacts are eliminated in accordance to the F-EIS:

- Impacts due to land movements that could cause erosion and sedimentations of the different water bodies at the project and near.
- Increase in noise levels
- Impact to wetlands, mangroves and other superficial water bodies
- Impact to agricultural and cattle pastures lands
- Possible impacts to service infrastructures as water, roads and communications
- Temporal increase in traffic at the Project Area
- Possible Impacts to Archeological sites

Most of those impacts cannot be avoided by construction specifications of the project, but these can be minimized with adequate construction control measures, project supervision and with the support of environmental agencies and municipalities. The alternative of no action does not eliminate possible impacts in their totality, since PREPA would be forced to continue using fuel from petroleum derivates that generate great amounts of emissions to the air. Air emissions are strictly regulated by state and federal agencies. The fulfillment with these regulations requires of millionaire investments on the part of PREPA. In addition, the maintenance of the petroleum derivatives burn unit's must be made more often to guarantee the optimal operation.

It is important for all companies to be able to fulfill its strategic plans of development. Fulfilling these plans demonstrates commitment with its clients, vision and stability. In addition, it demonstrates the ability of the company to evaluate complex situations of world-wide character and to develop strategies to minimize its impacts. After evaluating local and world-wide dynamics, PREPA developed a Strategic Plan as it guides of the future development of the company and Puerto Rico.

This Plan includes the following criteria:

- Diversification of Power Sources.
- Reduction of Costs
- Geographic diversification of Electrical Generation
- Environmental Considerations
- Plan of Expansion of Electrical Generation
- Diversification of Income

The construction of the Gasoducto del Sur is the first internal project of fuel diversification and is one several important environmental considerations that they will help PREPA to handle its power costs appropriately.

At the moment, PREPA only uses Diesel and fuel number 6 (Bunker C) at their facilities and buys electric power that co-generating AES at Guayama (coal) and Peñuelas' Ecoeléctrica Cogeneration Plant (natural gas) produce. Petroleum-based fuels continue to be the principal sources for energy generation for PREPA.

The AEE plans to reduce its petroleum use from 73.90 % to 52.2 % by year 2010. For this, it must take action and identify alternative fuels that can replace the actual and future demands of their clients. The lack of action would only aggravate the dependency of petroleum which in case of an restrain (embargo) or an increment of world-wide demands our island will not have viable options to generate electricity.

It is important to point out that PREPA is regulated by federal and state agencies on the type of fuel to be burned in their facilities. The biggest limitation relates to the percent of sulfur contained in the fuel. Low-sulfur fuel is more expensive than other fuels with higher percentage of sulfur. If there is shortage in this type of fuel or if purchase contracts with the suppliers cannot be established on time, the AEE has two options; to stop generating electricity, which is not viable, or burn a cheaper fuel with a higher percentage of sulfur to the one than they establish the permissions and to expose to fines and sanctions by the regulatory agencies.

The use of natural gas decrease atmospheric emissions of pollutants. The no action means that the PREPA will continue investing capital to reduce their petroleum emissions, and to give maintenance to their facilities instead of using that capital to develop a more efficient system with cleaner fuel.

The efficient use of energy is an important factor which has a significant impact on the clients invoice. PREPA has an educational program for the public, providing measures that can be implemented in homes, commerce and industries to reduce their energy consumption and to lower their electricity expenses. Also PREPA provides tariffs according to the use hours, which looks to promote the transfer the out of peak hours, which contributes to a more efficient use of energy power. Although those programs have been enforced for many years, the impact of such programs has been limited, and significant changes of client's energy demand did not occurs.

If PREPA chooses the no action alternative, the agency will need to reevaluate the actual educational programs to create more aggressive campaigns, directed to enforce energy saving strategies. The cost is one factor that affects the effectiveness of any program of efficiency energy use. The actual increment on petroleum derivates costs become an incentive to save energy. Otherwise, if the price becomes stabilized clients would continue with their use patterns limiting the effectiveness of any energy efficiency program. The actual tendency is an increase in the consumption of energy in spite of the increments of fuel prices. Due to the economic instability in the market, the cost of petroleum derivates will continue to increase, as presented in the following table:

Table 1: Increment on cost of Petroleum and Diesel from years 1990 to 2005. MBBO means Millions of Barrels of Oil Equivalent and BBL means Billions of Barrels of Oil equivalents.

Year	Petroleum Num.6			Diesel Num. 2		
	MBBO ¹	Cost	\$/BBL ²	MBBO	Cost	\$/BBL
1990	21.3	\$369,246,325.40	17.34	10.1	\$135,506,776.42	13.47
1991	22.3	\$263,841,266.00	11.81	4.4	\$115,631,158.27	26.27
1992	21.3	\$271,702,246.38	12.78	7.8	\$109,204,276.80	13.99
1993	16.2	\$230,602,454.94	14.22	2.2	\$51,252,336.29	22.84
1994	24.3	\$351,387,001.74	14.47	2.2	\$49,545,937.46	22.84
1995	25.7	\$412,575,390.15	16.07	5.5	\$167,055,621.86	30.11
1996	26.6	\$484,611,370.03	18.25	12.5	\$142,754,313.81	11.39
1997	27	\$525,291,269.05	19.46	6.5	\$507,075,017.08	78.17
1998	25.2	\$310,955,223.06	12.34	18.7	\$817,926,021.90	43.71
1999	25.8	\$395,581,508.13	15.33	9.8	\$259,490,401.08	26.34
2000	25.3	\$647,275,204.12	25.56	6.4	\$261,211,389.58	40.79
2001	24.2	\$518,319,562.37	21.43	6.8	\$204,293,746.10	29.79
2002	24.7	\$581,087,142.03	23.06	6.1	\$196,695,494.07	32.29
2003	23.5	\$692,799,766.38	29.44	5.3	\$211,284,944.28	39.6
2004	24	\$724,024,544.04	30.15	4.3	\$206,426,110.28	48.53
2005	25.2	\$1,159,593,065.33	45.95	6.4	\$460,733,456.68	71.7

¹ MBBO = millions of barrels of oil equivalent, ² BBL= billions of barrels of oil equivalent

2.1.2. Terrestrial Routes

The AEE contracted CSA Architects & Engineers, LLLP to conduct a Route Alternative Analysis for the Proposed Project. The study consisted of three stages: preliminary exclusion, exclusion and detailed selection.

The preliminary stage of exclusion was used to identify the greater amount of segments that could be included as sections of the Gasoducto del Sur. Those actions were considered to minimize the amount of municipalities impacted by the Project; to find the shortest and direct route; to analyze existing accesses and roads. In this stage twenty-nine (29) segments were identified within the study area, which resulted in multiple combinations of segments to evaluate diverse routes.

The exclusion stage's goal was to select two routes between 300 possible routes. Those combinations arose from the twenty-nine identified segments. Global Information System (GIS)

was used to determine preferred segments and final route analysis. This technology offers environmental information available on digital form. Eleven environmental criteria were evaluated. For each environmental condition a ranking system was developed to be applied to each segment. The "ranking" system indicates the favorable features of the segment towards the applied criterion of evaluation. A (+) was assigned if the segment is favorable for the evaluation criterion; (0), if it is neutral; and (-) if it is unfavorable.

The evaluated criteria are:

- Access facility
- Flood hazard
- Geomorphology and Soil features
- Existing utilities right of way
- Wetlands
- Forested areas
- Cultural and Archeological sites and resources
- Critical, vulnerable or endangered species
- Water bodies and aquifers
- Land use
- Units of class localization

The route analysis identifies the most favorable segments that could form the Gasoducto del Sur. Between those segments PREPA selected segment that formed the two routes (Alternative A and Alternative B) and studied those in detail.

Two terrestrial alternatives were evaluated and compared to select the best. For this, the percent of each route that would affect (and number of time impacted) the evaluated environmental criterion was compared and evaluated, according to each case. Conditions for each environmental criterion were evaluated and a "ranking" system was applied to them to obtain a method of partial comparison. The information was presented on an evaluation matrix. With the evaluation matrix the route was selected. The analysis is presented in Table 2:

Table 2: Evaluation matrix for route selection.

Criteria	Condition	Ranking		Alternative A		Alternative B	
		+	-	Result	Ranking	Result	Ranking
Access	% of the route at a distance \leq 0.25 miles of existing accesses	>16	<15	98%	+	98%	+
Flood Hazard	% of the route at zone 1	<33	>34	14.3%	+	3.9%	+
Geomorphology	% of the route inside fortress foundation categorized as poor or good	<33	>11	87.2%	-	82.6%	-
Wetlands	% of the route inside wetlands areas	<10	>21	18.0%	-	5.4%	+
Forest	% of the road inside forested areas	<20	<33	10.9%	+	11.8%	+
Land Use	% of the route inside compatible land use areas	>34	>50	89.2%	+	88.2%	+
Class Location	% of the route inside areas of class 2 and 3	\leq 50	>20	42.5%	+	65.9	-
Utilities	Amount of areas with utilities right-of-way conflicts	\leq 20	>20	13	+	26	-
Archeology and Culture	Amount of areas at a distance less than 100 meters from archeological or historical sites	\leq 2	\geq 3	2	+	3	-
Vulnerable, Critical and Endangered Species	Amount of areas at a distance of 100 meters from a habitat of an vulnerable, critical or endangered species	\leq 2	\geq 3	0	+	0	+
Water Bodies	Amount Water bodies crosses	\leq 11	\geq 11	5	+	5	+

The analysis determined that Alternative A is the better option and should be considered as the Applicant's Preferred Alternative. For this route PREPA incorporate some changes suggested by agencies, performed detailed field studies and has consulted involve municipalities, to include this final route a the Final-EIS.

2.1.3. Marine Routes

Marine routes require the use of difficult and expensive construction techniques, increasing the possibilities of an accident or environmental hazards, reason to discard any marine route in the exclusion stage, if there were other possible terrestrial routes.

Section 1003 of the 30 CFR, Mineral Management Service, Code of Federal regulations, Title 30, Part 250, Subpart J, submarine rights of way (30 CFR 250) requires that those pipelines are buried, to a minimum of 3 feet depth, when the depth of the sea is lesser than 200 feet. To construct a pipeline route deeper than 200 feet (avoiding excavation works and trenches); which could minimize the effect on benthic surroundings; is not feasible due to steep and highly variable sea bottom at the southern part of Puerto Rico. Bathymetry & shallow reefs studies of the area shows the variability of ground at that area, varying from 60 to more than 600 feet.

On depths of 200 feet is not required to construct a trench for the pipeline. The pipeline would rest at the sea bottom where an extremely corrosive atmosphere occurs, reason why this would not be feasible for the project.

The maximum depth for a marine alternative for the route would be of 150 feet or less. For this reason a marine pipeline required trench excavations. Those excavations would be extremely difficult, since they would require a great variety of construction methods that depend of the conditions of marine contour. Some methods are: mechanical excavation, jetting, dredged and explosions. All these methods cause irreversible disturbances to the benthic habitat and vicinity.

The construction cost and maintenance of a submarine pipeline is twice greater than the cost of a terrestrial pipeline. Also the submarine pipeline required specialized equipment from the United States.

A high marine traffic occurs at Tallaboa Bay and the Puerto de Las Americas. Also, there is high marine traffic at recreational areas like Jobos Bay, Playa de Ponce and Santa Isabel. During the 1993, boat traffic at Guayanilla Bay was of 576 trips. In addition, is known that the construction and use of the Port of the Américas at the Ponce Bay increase marine transit up to 1,200 boats per year. Boat traffic would have to be canceled or redirected during construction and maintenance phase of a marine pipeline.

The type of barge that would be used for construction and transport of the pipeline would require anchoring in a radial pattern that covers up to 500 meters outside the route. This will affect the marine commerce and the use of recreational boats during construction and maintenance of the pipeline.

2.1.3.1. Impact to natural systems

There is high possibility of finding rocks at the submarine route. Those areas required the use of explosives, necessary to open trenches for the pipeline. This would be detrimental for coral reefs, mangroves and benthic systems, especially on sensitive areas at the beginning and end of the route (Guayanilla and Jobos Bay, respectively).

A possible impact that would bring the construction of a marine route is the increase of turbidity during trench excavation and the later maintenance of the pipeline. This impact would be throughout the entire South coast, from Guayanilla to the CCC.

Between 1976 and 1989, eighteen species of marine mammals were observed in waters of Puerto Rico. The records corresponding to the area of the Guayanilla and Tallaboa Bays reveal the presence of common and bottlenose dolphins, pilot whales, goose-beaked whales, humpback whales and manatees. Of those marine mammals present at the Guayanilla and Tallaboa Bay, the Antillean manatee, is the only endangered species protected by federal and state law.

The mortality of manatees is associated, among other aspects, to boats collision, reason why an increase in the marine transit at the area for the excavation of trenches, construction and installation of a pipeline would represent a threat for the species, since it would increase the probability of an accident on those areas.

In addition, three fauna species listed as threatened or endangered were found at Jobos Bay, those are green turtle, hawksbill turtle and West Indian manatee.

The installation of the pipeline would require digging a traverse trench to a portion Caribe Key and filling with concrete that trench to minimize the possibility of ruptures of the pipeline. This action would cause erosion of coral reefs at the area. In addition, the portion of the pipeline that would cross the Jobos Bay would have to be buried in the same way to prevent ruptures caused by boats anchor.

Considering a submarine pipeline buried to transport the natural gas by the coasts through Pozuelo Point, raises serious environmental situations. The coast is covered also by coral reefs that would be affected by this selection. The pipeline throughout Jobos Bay would also need to be buried, since the pier is a boats refuge during hurricane season. Boats or barges in search of refuge could break the pipe when anchoring on emergency situations.

For reasons exposed above a submarine route is not a viable alternative for this project. The construction of a submarine route was discarded after evaluation during route selection, since it presents, among others, the following disadvantages:

- The construction of a pipeline to greater depths of 200 feet, although if trench excavation is not required, would have the problem of the corrosion and steep falls in the depth.

- If it is necessary to bury the pipeline (depths smaller than 200 feet) This type of construction presents the following issues:
 - Expensive trench drilling methods results on extremely high disturbance to marine habitats.
 - Cancellation or changes in the marine traffic, in special on those main ports of the southern region, some as which serve like refuges during hurricanes season.
 - Adverse Impacts and some irreversible ones in the marine habitats of the area: increase in turbidity throughout all the marine route; impact to endangered species like manatee, green turtle and hawksbill turtle; erosion and sedimentation damaging coral reefs near the trench.

2.1.4. Port or Import Terminal

There is a 1.5 millions of gaseoducts in the United States. The United States has only 5 (five) ports with the capacity for receiving natural gas. Puerto Rico has one (1) port (import terminal) at Peñuelas' Ecoeléctrica Plant. This Import Terminal has the capacity to fulfill PREPA's necessities. PREPA considered the alternative of constructing an import terminal near the existing facilities of the CCC with the goal of eliminate the possible impacts related to the construction of 42.4 miles of gaseoduct pipes. The construction of a Port would need a capacity, to receive, discharge and storage up to 3.0 Bcf/d (3 billion cubic feet) of imported natural gas and the facilities for gasification.

This implied the all the impacts related to construction and operation terminal, which include:

- Repair and expand the existing port at the site;
- Increase in boats traffic
- Construction of a storage tank for natural liquated gas and a gasification plant
- Dredging of Jobos Bay and disposal of approximately 11,239,000 cubic yards of dredged material.

The selection for construction of a Port and a gasification structure require deeper ports to minimize the impact associate to the construction and operation phase of the facilities. Also is necessary to develop the project of areas with low population density in accordance to an industrial development.

2.1.4.1. Evaluation Criteria

Three criteria were evaluated to determine if the construction of an Import Terminal is a viable alternative. Those criteria are presented below:

- Terrestrial area available – The area should have the sufficient land to accommodate and install all the project components as required by Liquefied Natural Gas (LNG) Facilities: Federal Safety Standards (49 CFR part 193) and the NFPA 59A (Standard for the Production, Storage, and Handling of Liquefied Natural Gas). The Plant for LNG has to fulfill with the standard regulatory distance for project component specially the storage tanks.
- Available coastal area - the area will need a import terminal with a port with facilities to anchor 950 feet long ships and navigable channels of 40 feet depth and aerial pass of 180 feet.
- Area for this disposal of dredge material during and after construction of the port.
- Adequate Infrastructure for the operation of the LNG facilities including confinable energy source and access roads. Also during construction is necessary a maritime access for the construction material barge.

2.1.4.2. Maritime operations

- The maritime operations of the LNG could increase the marine traffic at the area. For maritime operations the access channel need to the short to decrease the time content discharges and return to open sea again.
- A LNG barge will need an inner harbor of almost 1,200 feet wide and 40 feet depth for the turning area.

2.1.4.3. Environmental Issues

- It is important to consider the environmental impacts of the Project if the port is constructed. The project should be developed on a previously impacted area, including areas with industrial zoning. It is important to show compatibility with other plans on the region. The Project area should be develop on an area identify as industrial zoning and with similar land use at the vicinities.
- The Project will have to contemplate the distance from populated areas in compliance with Liquefied Natural Gas (LNG) Facilities: Federal Safety Standards (49 CFR part 193).

3.0 Impact Assessment

The objective of any impact assessment is to gather the information needed to make a fully informed decision regarding potential impact to threatened and endangered species.

The regulations for the Biological Assessment (BA) establishes that no development may be carried out unless it is designed to "avoid irreversible adverse impacts upon the survival of any local populations and individuals" of plants and animals that have been found to be threatened or endangered as designated by the USFWS. A copy of the Environmental Sensitivity Index Maps for the Project area is included (See Figures at Appendix 1).

To administer these standards, it must be known whether a population of threatened and/or endangered species is present in the area that will be affected by a proposed development. The most accurate way to determine the presence of such species is researching known threatened and endangered sighting records and documentation, habitat assessments and, as appropriate, field surveys of the area.

Potential adverse impacts on threatened or endangered species are considered significant if, the disturbance of the physical habitat due to human activity associated with the construction and/or operation of a project, results in one or more of the following: (1) direct mortality of an individual of a listed species; (2) permanent or long-term loss of existing or proposed critical habitat; and (3) temporary alteration or loss of habitat important for one or more listed species that could result in increased mortality or lowered reproductive success.

In addition to the evaluation of the potential direct effects of the Project on endangered species and their habitats, this BA also considers the indirect and cumulative effects of the proposed action on such species, together with the impacts of other activities that are interrelated or interdependent with the proposed action.

As a result of the flora and fauna studies performed at the Project areas and the revision of scientific literature of the natural and environmental resources of the extension of the GDS, conducted by the PREPA and its consultants, a list of the threatened and endangered species listed under the USFWS and NMFS federal programs, is included in the BA (Table 3 and Table 4).

The evaluated species list includes:

Table 3. Federally Listed Threatened and Endangered Species Analyzed for the Biological Assessment

Scientific Name	Common Name	Status/Jurisdiction
Bird		
<i>Caprimulgus noctitherus</i>	Puerto Rican Nightjar	Endangered/USFWS
<i>Agelaius xanthomus xanthomus</i>	Yellow-shouldered Blackbird	Endangered/USFWS
<i>Patagioenas inornata wetmorei</i>	Puerto Rican Plain Pigeon	Endangered/USFWS
<i>Pelicanus occidentalis</i>	Brown Pelican	Endangered/USFWS
Plants		
<i>Buxus vahlii</i>	Vahl's boxwood	Endangered/USFWS
<i>Trichilia triacantha</i>	Bariaco	Endangered/USFWS
<i>Cordia rupicola</i>	<i>Cordia rupicola</i>	Endangered/USFWS
<i>Eugenia woodburyana</i>	<i>Eugenia woodburyana</i>	Endangered/USFWS

Table 4. General Overview of Threatened and Endangered Species Evaluated in the Biological Assessment.

Item	Species	Distribution	Status	Comment
1	<i>Caprimulgus noctitherus</i>	Endemic to Puerto Rico	Endangered throughout its entire range	Known from the Guánica and Susúa forests, Sierra Bermeja, Cabo Rojo, Yauco, Maricao, Sabana Grande, Guayanilla, Peñuelas and Ponce. Present on the hills north of road PR-2 in Peñuelas and Ponce in the action area.
2	<i>Agelaius xanthomus xanthomus</i>	Endemic to Puerto Rico	Endangered throughout its entire range	Known from southwestern, southern and eastern Puerto Rico. Present in the vicinity of the Project in Aguirre Ward, Salinas.
3	<i>Patagioenas inornata wetmorei</i>	Endemic sub-species restricted to Puerto Rico.	Endangered throughout its entire range	Known mainly from Eastern-Central Puerto Rico with scattered reports through the island. Has been observed on a few occasions in Aguirre Ward, Salinas.
4	<i>Pelicanus occidentalis occidentalis</i>	Bahamas, Greater and Lesser Antilles down to Montserrat. South coast of N. America, Central America and north part of S. America.	Endangered throughout its entire range, except the U.S. Atlantic coast, Florida and Alabama.	Observed throughout the coastal areas and inland water reservoirs and large rivers of Puerto Rico. Known to roost on mangroves along the southern coast including Las Salinas in Ponce.
6	<i>Buxus vahlii</i>	Endemic to Puerto Rico.	Endangered throughout its entire range	Known from a few localities in the central karst, and on northwest and the south central mountains in Guayanilla and Peñuelas. Present in the action area on the forested limestone hills north of road PR-2 between Peñuelas and Ponce.
7	<i>Trichilia triacantha</i>	Endemic to Puerto Rico	Endangered throughout its entire range	Known from southwestern Puerto Rico from Cabo Rojo to Peñuelas. Present in the action area in the forested limestone hills north of road PR-2 between Peñuelas and Ponce.
8	<i>Cordia rupicola</i>	Puerto Rico and Anegada	Endangered throughout its entire range	Currently known from only one area in Puerto Rico. The known population site in Puerto Rico is located on privately owned land that forms part of a residential development.
9	<i>Eugenia woodburyana</i>	Endemic to Puerto Rico	Endangered throughout its entire range	Currently known only from the Sierra Bermeja in the municipalities of Cabo Rojo and Lajas, the Guánica State Forest, Almácigo Alto Ward in Yauco, Peñuelas, and Vieques. Present in the action area in the forested limestone hills north of road PR-2 between Peñuelas and Ponce.

4.0 Species Account

This section provides information on the status, life history, habitat requirements, and range of sensitive species that occur, or have the potential to occur, in the project area. Sensitive species include both federal and state listed species, as well as species currently being considered for listing. Information on the distribution and population status of listed species in the project area and surrounding region, as determined through recent survey efforts, published and unpublished literature, management plans, and communication with local experts, is also included. The following criteria were used to determine the list of sensitive species covered in this document and preliminary analysis:

- Species considered by the agencies that are federally or state listed as threatened, endangered, candidate or proposed, and occur or have the potential to occur within the Project area. Non-federally listed species considered herein are examined if there appears to be a potential of a future federal listing;
- Species observed in the project area as recorded in the Flora and Fauna Study of miles 2.98 and 7.98;
- Species that have the potential to occur in the project area as determined or suggested by USFWS and previous studies;
- Species on the USFWS Office list "Listed and Proposed Species" that occur or have the potential to occur in the Proposed Project area.

4.1. Wildlife

4.1.1. Puerto Rican Nightjar (*Caprimulgus noctitherus*)

4.1.1.1. General Species Biology

The Puerto Rican Nightjar (*Caprimulgus noctitherus*) is small (8.5") nocturnal bird with long bristles about the mouth with mottled gray brown and black plumage. The Nightjar (PRN) is predominantly an understory bird where it feeds on flying insects and has been observed to have favorite perches, from which they sally to pursue nocturnal flying insects beneath the forest canopy seldom do they fly above the emergent trees, preferring to stay under the forest canopy. Males call throughout the year, particularly

at dusk and before dawn, especially from November to May. Breeding and nesting is from late February through July, with a peak period from April to June (USFWS, 1984).

Puerto Rican Nightjars do not construct nests; they lay their eggs directly on leaf litter under scrub vegetation, where the forest canopy ranges from four to six meters in height and usually avoids open areas or clearings. The average clutch size is two eggs. Incubation is done by both the female and the male and lasts about 20 days. After hatching, the young are able to fly around on the 14th day (USFWS, 1984).

4.1.1.2. Distribution and Abundance

The Puerto Rican Nightjar was considered extinct until G. B. Reynard reported it in southwestern Puerto Rico in 1961 (USFWS, 1984). This Nightjar is endemic to Puerto Rico, and is may be locally common through its patchy distribution. The natural history of the Puerto Rican Nightjar was poorly known until recently. The species was listed as endangered throughout its range in 1973 (Federal Register, 1973).

Nightjar habitat in southwestern Puerto Rico consists of mature undisturbed forests representative of the Subtropical Dry Forest Life Zone (Vilella, 1987), where the vegetation tends to form complete ground cover, and is almost entirely deciduous on most soils (Ewel and Whitmore, 1973). Trees usually do not exceed 15 meters in height and their crowns are typically broad, spreading and flattened with sparse foliage.

Kepler and Kepler (1973) estimated that a breeding population of 400 pairs may be present near the Guánica and Susúa state forests. The Puerto Rican Nightjar also occurs sparingly in other localities in the dry limestone forests of the southwest coast of Puerto Rico, from Ponce to El Combate, extending north to Sabana Grande and Maricao. The most recent surveys indicate stable populations of Nightjars in the Guánica and Susúa State forests and the hills in Guayanilla. Studies by Vilella (1989) and Vilella and Zwank (1993) estimate a population of 712 singing male Puerto Rican Nightjars distributed on 9,838 hectares: Guánica (347), Guayanilla-Peñuelas (188) and Susúa-Maricao (177). Recent studies have confirmed the presence of this species in the hills north of road PR-2 between Peñuelas and Ponce (Salguero-Faria, personal communication).

4.1.1.3. Current Conditions

The Puerto Rican Nightjar is one of the endangered species known to occur within the Project site in the hills between Peñuelas and Ponce. Vilella and Zwank (1993) surveyed 2,701 ha of dry limestone forest and their study shows the presence of 188 Nightjars in the Guayanilla-Peñuelas region. The study only surveyed 66% of the available Nightjar habitat in the Guayanilla-Peñuelas region. Nightjars were heard singing on grazed lands where the canopy was retained although in lower numbers, suggesting that Nightjars can exist on lands with some degree of disturbance (Vilella and Zwank, 1987). Specifically for the area of Peñuelas and Ponce where the Project is proposed, Vilella and Swank (1993) detects the presence of the Puerto Rican Nightjar in multiple surveys (6 total areas and four surveys on each). Those areas were not studied before 1992.

In an effort to assess the situation of the local population of nightjars within miles 2.98 through 7.98 of the Project a survey was conducted on February 19-23 and 26, 2007. Six (6) observation points surveying a radius of 100 meters (31,400 m²) were censused during dawn (0500 to 0800) and dusk (1700 to 2000) hours for 6 days. As result of the field survey one (1) to nine (9) nightjars were detected on morning and nocturnal visits. Also, some additional sightings were obtained during the search of endangered flora at the area. At observation point OP1 a single male was heard calling on October 18, 2006 in this location; OP4, one (1) male was heard calling on September 7, 2007 at 1000 hours during endangered tree inventory at the area; OP6, a male was observed perched on *Buxus vahlii* on August 21, 2007 at 1400 hours; OP7 a single nightjar was heard during field visit on early morning on August 21, 2007; OP9, three (3) nightjars were detected on July 18, 2007 field visit between 0815 and 0900 hours. The Puerto Rican Nightjar was heard and seen during all field visits (diurnal and nocturnal visits) through the area, except the observation point (OP10) that is very impacted and open (See appendix 3: Endangered Species Field Study).

Approximately 53.81 acres (217,176.34 m²) of Nightjar habitat will be impacted by the Proposed Action at the municipalities of Peñuelas and Ponce. A total of 55 male nightjars were detected during morning and evening surveys for an average of 4.58 birds per observation point. The total area of the study area is approximately 311,990

m², therefore it is estimated that 45.5 male nightjars on 21.75 ha (2.09 males per hectares) are defending territories within the vicinity of the Project area.

4.1.1.4. Summary of Impacts

It is expected that an area of approximately 53.81 acres (75 feet right-of-way throughout 5.2 miles, with some areas extended to 120-foot wide due to machinery requirements, only at the mountainous area of Peñuelas and Ponce between mile 2.98 and 7.98) of nightjar habitat will be directly impacted during the construction phase and the operation phase of the Project. The permanent impact would be of 31.0 acres (31.91 cuerdas) as the service ROW would have a width of 50 feet. The temporary impact (additional to the permanent impact) would be 24.40 acres due to the construction activities in the action area between Peñuelas and Ponce as the construction ROW will increase temporarily 75 feet to the service ROW. Trench construction and operation would imply the fragmentation of nightjar habitat, increasing the edge effect which may provide the conditions for an increase in vine growth, which may hamper the bird's ability to forage between the forest patches.

If Puerto Rican Nightjar habitat becomes fragmented into smaller patches, more of this population will end up adjacent to a different habitat not preferred by the species. At Peñuelas and Ponce area, the forested throughout miles 2.98 to 7.98 have the characteristic needed for this endangered bird. If fragmentation occurs, land that is deep in the middle of a forest will be impacted, creating what is known as the edge effect. For the Puerto Rican Nightjar, studies demonstrate that the species have preferences determining their habitat between forest core or forest edges. Shaded areas with leaf litter accumulated at the forest ground are preferred by the species (Vilella and Zwank 1993 and 1995).

Habitats have such an impact on the physical environment that they can create their own microclimate. For example, dense forests tend to be shadier, more humid, and less windy than adjacent not forested land. This pattern becomes more pronounced the farther you go away from the edge of the forest. If a patch of forest becomes small enough, then you will always be near the forest's edge. Some species require the

solitude, deep shade and protection from wind that you can only find in the middle of a dense old-growth forest (Pfister, 2004).

4.1.1.5. Indirect, Interdependent, Interrelated and Cumulative Effects

No indirect and interdependent impacts are expected to be associated with the proposed action. Interrelated and cumulative effects are expected to be associated to the current loss and fragmentation of forest within Puerto Rican Nightjar habitat. Several development projects are being planned and constructed in the vicinity of the action area.

4.1.1.6. Conservation Measures and Recommendations

PREPA would acquire suitable Nightjar habitat for perpetual conservation in the vicinity of Peñuelas and Guayanilla as part of the mitigation efforts coordinated with federal and local agencies. The land to be acquired by PREPA has been identified by several agencies as prime conservation area adjacent to El Convento Caves. The amount of land to be acquired will increase considerably the protected habitat for the Nightjar and avoid any new developments in the area.

The Applicant would also use the material extracted from the trench for filling, minimizing the amount of material required from nearby quarries. In addition, the Project does not contemplate extraction of fill material from other forested areas within the vicinity of the action area. If there is the need for additional fill material, PREPA would not accept fill from quarries that extract materials from potential or known areas used by the Puerto Rican Nightjar or other threatened or endangered species.

A construction protocol and educational program would be implemented to ensure that all construction activities minimize any potential and avoidable impacts during this phase. These efforts would be coordinated by an on-site trained biologist. All construction activities would be performed during the non-breeding period (August 5 – February 24) between 0700 and 1730 hours. A permanent construction restriction would be programmed and fulfilled during the reproductive period of the species during the months of February to August.

4.1.1.7. Conclusion

In view of the preceding analysis, it is determined that the proposed action would affect, not likely to adversely affect the Puerto Rican Nightjar and its habitat within the action area.

4.1.2. Yellow-shouldered Black Bird (*Agelaius xanthomus*)

4.1.2.1. General Species Biology

The Yellow-shouldered Blackbird (*Agelaius xanthomus*) is a small (8-9") passerine, whose adults and juveniles of both sexes are glossy black with yellow shoulder epaulets. The only difference between males and females is their size (USFWS, 1983). Males are significantly larger, about 17 percent by weight, than females. It is considered an arboreal insectivore, although it is known to feed on cooked rice, granulated sugar, fruit and other domestic foods. Moths and crickets are a major source of food. The Yellow-shouldered Blackbird was first listed as endangered on November 19, 1979 (USFWS, 1983).

The Yellow-shouldered Blackbird is endemic to Puerto Rico, Mona and Monito Island. Once widespread throughout the Island, the species distribution is now restricted to the coastal southwestern area; a small coastal eastern area near Ceiba; and Mona Island. Also at Aguirre ward at the Municipality of Salinas in the south coast, have the largest population in Puerto Rico, excluding Mona Island. The Yellow-shouldered Blackbird nests from April to October in southwestern Puerto Rico. The open, cup-shaped nests are usually constructed in trees. Post and Wiley (1976) indicated that during the nesting season, most of the birds of the southwestern population stayed either in mangrove forests or the arid coastal fringe.

Nesting also occurs in mangroves along the coast and on small offshore islands. Other nesting habitat includes large deciduous trees like the turpentine tree (*Bursera simaruba*), coconut palms (*Cocos nucifera*) and Puerto Rican royal palms (*Roystonea borinquena*). Yellow-shouldered Blackbirds of the eastern population use cavities or hollows in dead mangroves, and those in Mona build their nests on the ledges or in crevices of the coastal cliffs. The average clutch size is 2-4 eggs. Nesting pairs often

aggregate and nests can be found as close as 20 feet from another. The female handles all incubation and breeding, while the male shares equally with feeding the young (USFWS, 1983).

The Yellow-shouldered Blackbird breeding season commonly spans from April to August but breeding activity has been observed from February to November. Yellow-shouldered Blackbirds are non-migratory birds, but a portion of the population of the nominate form moves from coastal areas to inland areas during the non-breeding season to feed.

The loss of feeding and breeding habitat and brood parasitism by the Shiny Cowbird (*Molothrus bonariensis*) are among other threats that limit and endanger the Yellow-shouldered Blackbird populations. Natural predators, such as the Pearly-eyed Thrasher (*Margarops fuscatus*), also represent a threat, although minor, to the populations. These animals have been reported to steal eggs and young from nests and to also destroy or steal nesting materials. Also, nest predation has been an important contributor to the decline of the Yellow-shouldered Blackbird. Known terrestrial predators include rats (*Rattus rattus*), mongooses and feral cats, all introduced species to Puerto Rico.

4.1.2.2. Distribution and Abundance

In the past, the Yellow-shouldered Blackbird was widespread and abundant in Puerto Rico and Mona Island (USFWS, 1996). Present distribution of the Yellow-shouldered Blackbird in Puerto Rico is limited to Roosevelt Roads Naval Station in the East, Salinas and Guayama in the south and the southwestern corner of the island. An endemic subspecies is found on the islands of Mona and Monito (USFWS, 1996).

Estimated populations of the Yellow-shouldered Blackbird in 1976 were 200 in eastern Puerto Rico; 2,000 in southwestern Puerto Rico; and 200 in Mona Island. More recent estimates indicate that there are approximately 350 individuals in the southwest, less than 25 in eastern Puerto Rico and from 400 to 500 in Mona. This amounts to a total of about 825 Yellow-shouldered Blackbirds left in the world (USFWS, 1996).

Critical Habitat has been designated for the Yellow-shouldered Blackbird and includes the following areas:

- Mona Island: The entire Island Puerto Rico: An area of land, water and airspace beginning at a point where Quebrada Boquerón meets Boquerón Bay; then proceeding southwesterly along the coast to Cabo Rojo; then eastward along the coast, including offshore cays, to the point where PR-332 meets Guánica Bay; then northward on PR-332 to its junction with PR-116; then westward on PR-116 to its junction with PR-305; the westward on PR-305 to its junction with PR-101 to the point where it crosses Quebrada Boquerón; then along Quebrada Boquerón to the point where it joins Boquerón Bay.
- A circular area of land, water and airspace with a 1-mile radius, located at junction of PR-360 and PR-102 in the town of San Germán.

4.1.2.3. Current Conditions

The only records for the Yellow-shouldered Blackbird within the action area are in the vicinity of the Salinas Municipal Landfill in Aguirre Ward. This species is known to breed in the mangroves of Punta Colchones in Jobos Bay NERR and feeds near houses in the municipalities of Salinas and Guayama, demonstrating that the species adapts to highly impacted areas where food is available (CSA, 2004).

4.1.2.4. Summary of Impacts

No direct impacts to the Yellow-shouldered Blackbird or its habitat are expected to occur as a result of the proposed action. The proposed pipeline would be installed along the existing road leading toward the Aguirre Thermo-electrical Power Plant; therefore no impacts would occur to existing habitat.

4.1.2.5. Indirect, Interdependent, Interrelated and Cumulative Effects

The construction and operation of the GDS may have indirect impacts to this species or its habitat. Noise and earth movements near the Yellow-shouldered Blackbird habitat may disrupt their normal behavioral patterns as a result of the construction procedures near Aguirre on the eastern end of the Project. Therefore, there is the possibility of interdependent, interrelated or cumulative effects on the Yellow-shouldered Blackbird as a result of the proposed action.

4.1.2.6. Conservation Measures and Recommendations

The planting and mitigation actions to attend the direct impact to wetland areas would take into consideration the use of plant species that are preferred by the Yellow-shouldered Blackbird. Blackbirds would benefit from the creation of new habitat resulting from the mitigation efforts that would be implanted to offset any loss of mangroves by the proposed action.

Even though no blackbird habitat would be impacted, the applicant would implement a construction protocol and an educational program would be implemented to ensure that all construction activities minimize any potential and unavoidable impacts. These efforts will be coordinated by an on-site trained biologist.

4.1.2.7. Conclusion

It is anticipated that development of the GDS would not have direct effects on the Yellow-shouldered Blackbird and its habitat. In view of the preceding analysis, it is determined that the proposed action would not affect the Yellow-shouldered Blackbird and its habitat within the action area.

4.1.3. Puerto Rican Plain Pigeon (*Patagioenas inornata wetmorei*)

4.1.3.1. General Species Biology

The Puerto Rican Plain Pigeon (*Patagioenas inornata wetmorei*) is a large pigeon similar in size and shape to the Rock Pigeon (*Columba livia*). At a distance the species appears pale blue-gray. It is also identified by the reddish-brown on wings and breast, and white fringes the wing coverts (Wiley et al., 1982). The Puerto Rican Plain Pigeon Recovery Plan was approved on October 14, 1982, and is currently under revision.

Approximately 70 percent of the foods come from tree branches, and 30 percent from the ground. Principal foods are royal palm (*Roystonea borinquena*); mountain immortelle (*Erythrina poeppigiana*); West Indies trema (*Trema lamarckiana*); and white prickly (*Zanthoxylum martinicense*). Water is usually taken from the axils of bromeliads or from water-retaining blossoms of the African tulip-tree (*Spathodea campanulata*) (Wiley et al., 1982).

Breeding occurs throughout the year but peaks in late winter and spring. Some nests are flimsy platforms of twigs, occasionally placed on unused rat nests or on an accumulation of litter in a crotch or tangle of vines. More typically, nests are built on a bare forking tree branch or near the top of a bamboo stalk. The Puerto Rican Plain Pigeon usually lays only one egg, but a female may produce three broods in a year (Wiley et al., 1982).

4.1.3.2. Distribution and Abundance

The Puerto Rican Plain Pigeon historically was widespread in the western foothills and valleys of Puerto Rico. Old records exist from Utuado, Lares, Añasco, Morovis (cave deposits), and Ponce (cave deposits). A pair was observed at Añasco in 1926, and then no further sightings were documented until 1959, when a Puerto Rican Plain Pigeon was shot in Naguabo (USFWS, 1982). In the past, the typical species habitat include lowland swamps and woodland, open woodland and cultivated land in the mountains, limestone karsts, and coffee plantations in upland hills. The presently occupied habitat is located in the Subtropical Moist Forest. In Puerto Rico, its numbers dropped to 100 in the 1970s but rebounded to 700 or so by 1996 (Birdlife, 2000).

Today, habitat loss due to the rapid development of habitat areas is the most serious threat to the species' existence. Disturbance is a concomitant problem. The majority of nest failures observed during investigations between 1973 and 1975 were the result of human-caused disturbances (Perez-Rivera, 1978). Severe storms and hurricanes are considered a potential threat in that they could destroy essential habitat and kill the birds. Some pigeons are still being shot despite a Commonwealth Regulation (1967) closing the permits to hunt the species. Establishment of new populations apparently has been limited by the bird's reluctance to colonize new areas.

4.1.3.3. Current Conditions

The species has been reported on a few occasions at Jobos Bay NERR. It is known to visit the Aguirre State Forest, approximately 2 miles west of the proposed Project. No known habitat occurs along the 42.4-miles of the action area.

4.1.3.4. Summary of Impacts

The Project would not impact the Puerto Rican Plain Pigeon. There is no suitable or known nesting or roosting areas within the Project area. Reports show that the Puerto Rican Plain Pigeon forages in Aguirre Forest in Guayama and not in the vicinity of the action area.

4.1.3.5. Indirect, Interdependent, Interrelated and Cumulative Effects

The Puerto Rican Plain Pigeon has not been recorded in the area of the proposed action; therefore there are no expected interdependent and interrelated effects on this species.

4.1.3.6. Conservation Measures and Recommendations

No specific conservation measures are proposed for this species.

4.1.3.7. Conclusion

Based on the significance criteria outlined in Section 3.0 of this BA, and the information contained herein, PREPA has determined the proposed action would not affect the Puerto Rican Plain Pigeon.

4.1.4. Brown Pelican (*Pelecanus occidentalis occidentalis*)

4.1.4.1. General Species Biology

The Brown Pelican (*Pelecanus occidentalis*) is a large water bird (42-52") with unusual bill and dark gray-brown coloration with white about the head and neck. The Caribbean subspecies (*Pelecanus occidentalis occidentalis*), has a darker undersurface plumage during breeding than does the Eastern Brown Pelican (*Pelecanus occidentalis carolinensis*). Pelicans can reach up to 8 pounds in weight and the larger individuals have wingspans of more than 7 feet. The Brown Pelican is found along the coast in California and from North Carolina to Texas, Mexico, the West Indies, and many Caribbean islands, as far south to Guyana and Venezuela. Brown Pelicans nest in colonies on offshore cays and small islands. They usually build their nests on mangrove trees, but ground nesting may also occur. Nesting occurs in trees which hold a firmly constructed nest made of sticks, reeds, straws and grasses.

Breeding may occur during any season and may vary from year to year (Raffaele et

al., 1998) and a normal clutch size is 2-4 eggs. The Caribbean subspecies begins nesting around May and reaches its peak during September through November. All courtship behavior is confined to the nest site, and both the female and male share in incubation and rearing duties. Brown Pelicans inhabit and feed in shallow estuarine waters, including bays, lagoons and other protected coastal areas and calm ocean waters. They seldom venture more than 20 miles out to sea. Sand pits and mangrove islets are used frequently as daily loafing and resting areas.

4.1.4.2. Distribution and Abundance

In Puerto Rico, Brown Pelicans are known to breed at three sites: Cayo Conejo, off Vieques southeastern coast; Añasco, on the west coast; and Montalva Bay, near La Parguera, on the southwestern coast. Nesting has also been attempted at Guánica Bay, Guanajibo and Aguadilla (USFWS, 1986). Pelicans are frequent visitors to the coastal areas near the proposed project site, and have been observed all around the southern coast.

4.1.4.3. Current Conditions

Although Brown Pelicans are regularly observed flying and foraging throughout the coast of the island, the breeding success of the species in Puerto Rico is relatively low. Pelicans have been observed roosting on the mangroves of El Tuque in Ponce.

4.1.4.4. Summary of Impacts

The Project would not impact directly the Brown Pelican in the action area. There is no suitable nesting or roosting habitats in the Project area. It is anticipated that normal behavioral patterns of Brown Pelicans would not be disrupted during construction due to the distance of their habitat through the action area.

4.1.4.5. Indirect, Interdependent, Interrelated and Cumulative Effects

The Brown Pelican has not been recorded in the proposed action area; therefore there are no expected indirect, interdependent and interrelated effects on this species.

4.1.4.6. Conservation Measures and Recommendations

No specific conservation measures are proposed for this species.

4.1.4.7. Conclusion

Based on the significance criteria outlined in Section 3.0 of this BA, and the information contained herein, the Applicant has determined the proposed action would not affect the Brown Pelican.

4.2. Vegetation

4.2.1. Vahl's boxwood (*Buxus vahlii* Baill.)

4.2.1.1. General Species Biology

Vahl's boxwood (*Buxus vahlii*) is a small evergreen shrub or tree measuring up to 15 feet tall and 5 inches of DBH (Diameter at breast height). The leaves are more or less oblong, simple, opposite and about 1.5 inches long and 0.75-inch wide. The flower cluster is small and is composed of a solitary female flower and several male flowers just below it. Flowering takes place from December to early April. This species does not reproduce vegetatively. It is found growing as an understory shrub in semi-shaded conditions in semi-evergreen seasonal limestone forests at elevations ranging from 80 to 650 ft. (USFWS, 1987).

4.2.1.2. Distribution and Abundance

Vahl's boxwood is only known from Puerto Rico, where it has been recorded at three locations, Punta Higüero in Rincón, Hato Tejas in Bayamón, and the hills located to the north of PR-2 between Guayanilla and Ponce. In 1984, there were an estimated 16 plants at the Rincón site and 24 plants at Hato Tejas.

4.2.1.3. Current Conditions

The USFWS and the DNER have confirmed the presence of this species in the hills located to the north of PR-2 between Guayanilla and Ponce. No exact population estimate or condition is available for the entire Ponce – Peñuelas mountainous area. The DNER has identified approximately 500 individuals of Vahl's boxwood at an earth extraction (Valdivieso Quarries) area at the municipality of Peñuelas (José Sustache, personal communication).

As part of this site visit and biological evaluation, CSA biologists found a total of 408 individuals of Vahl's boxwood in the vicinity of the action area (see Appendix 3).

4.2.1.4. Summary of Impacts

The 408 Vahl's boxwood individuals present within the action area would not be impacted due to new route changes evaluated during Proposed Project planning phase. PREPA have performed all actions and contingencies to avoid any impact to the species within the action area and vicinities.

4.2.1.5. Indirect, Interdependent, Interrelated and Cumulative Effects

No indirect and interdependent impacts are expected to be associated with proposed action. Interrelated and cumulative effects are expected to be associated to the current loss and fragmentation of forest within Vahl's boxwood habitat. Several residential and industrial developments are being planned and constructed in the vicinity of the action area.

4.2.1.6. Conservation Measures and Recommendations

The Applicant would use the material extracted from the trench for filling, minimizing the amount of material required to be extracted from nearby quarries. In addition, the Project does not contemplate extraction of fill material from other forested areas within the vicinity of the action area. If there is the need for additional fill material, PREPA would not accept fill material from quarries that would extract materials from potential or known areas where the Vahl's boxwood or other threatened or endangered species may be found.

Individual plants where founded at the vicinity of the action area, those are unlikely candidates for transplant due to the geological and soil characteristics in the area. Therefore, the Applicant has already changed the route delineation at the area where the 408 individuals of Vahl's boxwood were observed, avoiding any possible impact to this population.

A construction protocol and educational program would be implemented to ensure that all construction activities avoid any potential impacts during this phase. These efforts will be coordinated by an on-site trained biologist.

4.2.1.7. Conclusion

It is anticipated that construction of the GDS have perform all possible action to avoid impacting the population of Valh's boxwood and its habitat. In view of the preceding

analysis, we determined that the proposed action would not affect the Valh's boxwood population and its habitat within the action area.

4.2.2. Bariaco (*Trichilia triacantha* Urban)

4.2.2.1. General Species Biology

Bariaco (*Trichilia triacantha*) is an evergreen shrub or small tree that may reach up to 30 feet in height and 3 of DBH (Little et al., 1973). The alternate leaves are shiny dark green, leathery, and clustered at the ends of twigs. Each compound leaf is 3 to 7-parted with leaflets appearing to be arranged palmate and bearing three stiff, sharp spines at their apex. Bariaco flowers are white, symmetrical and bisexual. Bariaco has been observed to flower from January to March in the Guánica State Forest. Flower production is abundant but fruit set appears to be poor. Pollination mechanisms are not known, although other members of this genus are wind or insect pollinated.

4.2.2.2. Distribution and Abundance

Bariaco is endemic to the southwestern of Puerto Rico. Specifically is restricted to the dry limestone forests of this part of the Island. Extensive areas of this life zone overlie limestone, including the area in which Bariaco is found. It can be found in the deciduous and the semi-evergreen seasonal forests of the subtropical dry forest zone at elevations of less than 100 feet. Approximately 40 individuals are known to exist in two populations located in the Guánica State Forest and Punta Guaniquilla near Boquerón. One population was reported from the Guayanilla hills near Peñuelas, but has apparently been eliminated by woodcutting and road construction (USFWS, 1991). DNER and CSA personal also found the species at the hills north to the road PR-2 in Peñuelas near power lines north of Las Cucharas Penitentiary.

These forest types where Bariaco is found, typically consist of two tree or shrub strata. Trees in the upper strata of the deciduous forest reach 10 meters in height. Common emergent species include *Bucida buceras* (úcar) and *Bursera simaruba* (almácigo). Bariaco is found in the lower strata associated with common species such as *Coccoloba microstachya* (uvillo), *Krugiodendron ferreum* (palo de hierro), *Amyris*

elemifera (tea), and *Pisonia albida* (corcho). Soils in the semi-evergreen forests retain greater moisture, trees are somewhat taller and a larger number of evergreen species are found.

Because of the rarity of this species, it could easily be eliminated through woodcutting, flash-flooding, and other human actions. Its wood is known for hardness, durability, and color, which makes it particularly valuable for utilitarian purposes. It has been affected in the past by deforestation for urban development, agriculture, grazing, charcoal production, and the cutting of wood for fenceposts.

4.2.2.3. Current Conditions

Bariaco has been affected in the past by deforestation by urban development, agriculture, grazing, charcoal production and the cutting of wood for fence posts (USFWS, 1991).

The DNER has confirmed the presence of this species in the hills located to the north of PR-2 between Guayanilla and Ponce. Though no exact population estimates are available at the agencies for the area between Ponce and Peñuelas. The DNER on previous visit to the areas has identified approximately 10 individuals of Bariaco in the vicinity of the Project (José Sustache, personal communication).

As a result of the Endangered Species Field Study a total of three (3) individuals of Bariaco (*Trichilia triacantha*) were identified in the vicinity of the action area (see appendix study). One individual was accidentally felled by the land survey team but was observed resprouting.

As part of the preliminary assessment to the vicinities of the Project Area, twenty-six (26) additional individuals were identified outside the action area in the ROW of the PREPA power lines between the Las Cucharas Penitentiary and the action area. Five (5) of these individuals were dead. Those individuals will be protected at the area and also PREPA provide education to the maintenance personal and provide new signs to identify the species and indicate the actions to be performed to preserve this population.

4.2.2.4. Summary of Impacts

The three (3) Bariaco individuals present within the action area would not be impacted due to new route changes evaluated during Proposed Project planning phase. Actually, the route between miles 3 and 4 was moved to avoid any possible impact to the species. The three individuals present at the vicinities of the action area would be preserved and protected during construction activities with a route change between mile 3 and 4 of the Project. With this action PREPA avoid any permanent lost or reduction of the poor gene pool of the local population which is very scarce.

4.2.2.5. Indirect, Interdependent, Interrelated and Cumulative Effects

No indirect and interdependent impacts are expected to be associated with proposed action. Interrelated and cumulative effects are expected to be associated to the current loss and fragmentation of forest within Bariaco habitat. Several residential and industrial developments are being planned and constructed in the vicinity of the action area.

4.2.2.6. Conservation Measures and Recommendations

The Applicant would use the material extracted from the trench for filling, minimizing the amount of material required to be extracted from nearby quarries. In addition, the Project does not contemplate extraction of fill from other forested areas within the vicinity of the action area. If there is the need for additional fill material, PREPA would not accept fill material from quarries that would extract materials from potential or known areas where Bariaco or other threatened or endangered species may be found.

The individual plants found in the action area are unlikely candidates for transplant due to the geological characteristics in the area. Therefore, the Applicant has changed the route at this area to avoid the impact to those individuals.

A construction protocol and educational program would be implemented to ensure that all construction activities minimize any potential and avoidable impacts during this phase. These efforts will be coordinated by an on-site trained biologist.

4.2.2.7. Conclusion

It is anticipated that construction of the GDS have perform all possible action to avoid impacting the population of Bariaco and its habitat. In view of the preceding analysis, we determined that the proposed action would not affect the Bariaco and its habitat within the action area.

4.2.3. *Cordia rupicola* Urban

4.2.3.1. General Species Biology

Cordia rupicola is a small woody shrub, originally described as endemic to Puerto Rico (Britton and Wilson 1925). The branches are hairy and the scabrous leaves area ovate to elliptic or oblong-elliptic, 2-9 cm long and 1-4.5 cm broad. White flowers are sessile and borne on head inflorescences which may be terminal or axillary. Fruits are red drupes approximately 4.5 mm long. *Cordia rupicola* inhabits dry limestone thickets in southwestern Puerto Rico, Vieques and Anegada.

4.2.3.2. Distribution and Abundance

Cordia rupicola was previously thought to be endemic to Puerto Rico, including Vieques, but it was reported in 1987 from the island of Anegada in the British Virgin Islands. The German botanical collector Paul Sintenis first discovered this species in 1886 at Los Indios, located between Barinas and Guayanilla, Puerto Rico. It was later found in Guánica, Puerto Rico, in 1887, and again in 1943 and 1959 (Proctor 1991). Proctor (1994) reported a specimen from Punta Jalova, Vieques Island possibly the same individual observed by Woodbury, around 1978. Surveys conducted in 1991 did not find the species at the historical locations in Guánica and Guayanilla (Proctor 1991). At that time, the only known extant population was that of Anegada.

Surveys conducted in 1995 located the species in the area of Peñuelas, at a site called El Peñón. Approximately 15 plants of *Cordia rupicola* have been located at this site. Some plants were observed with fruit in the month of January. Other rare and endangered plants, *Eugenia woodburyana*, *Myrtus bellonis*, *Passiflora bilobata*, and *Nashia inaguensis*, are also known from that site (Breckon and Kolterman 1996). In 2003, three individuals of *Cordia rupicola* were found adjacent to a trail within the Guánica State Forest (USFWS, 2005) though no specimens of *Cordia rupicola* were

found during a survey on Vieques Island in 1995-1996, a specimen was found in 2005 on the Lighthouse Peninsula in Vieques Island (USFWS, 2005). No more than 25 individuals of *Cordia rupicola* are known from the Puerto Rico locality (USFWS, 2005).

4.2.3.3. Current Conditions

Cordia rupicola has not been recorded in the action area.

4.2.3.4. Summary of Impacts

Cordia rupicola has not been recorded in the action area therefore there are no expected direct impacts on this species.

4.2.3.5. Indirect, Interdependent, Interrelated and Cumulative Effect

No indirect and interdependent impacts are expected to be associated with proposed action. Interrelated and cumulative effects are expected to be associated to the current loss and fragmentation of forest within *Cordia rupicola* habitat. Several residential and industrial developments are being planned and constructed in the vicinity of the action area.

4.2.3.6. Conservation Measures and Recommendations

No specific conservation measures are proposed for this species.

4.2.3.7. Conclusion

Based on the significance criteria outlined in Section 3.0 of this BA, and the information contained herein, the Applicant has determined the proposed action would not affect the *Cordia rupicola*.

4.2.4. *Eugenia woodburyana* Alain.

4.2.4.1. General Species Biology

Eugenia woodburyana is a small, evergreen tree which may reach six meters in height. The leaves are opposite, obovate, pilose on both sides, glandular-punctate below, and from 1.5 to 2 centimeters long and 1 to 1.5 centimeters wide. The inflorescences are axillary, and have 2 to 5 flowers. The striking fruit is red upon maturity, eight-winged and 2 centimeters in diameter.

4.2.4.2. Distribution and Abundance

Eugenia woodburyana is found in the deciduous and semi-evergreen seasonal forests of the subtropical dry forest life zone of southwestern Puerto Rico at elevations of less than 100 meters. *Eugenia woodburyana* is endemic to Puerto Rico and currently known only from the Sierra Bermeja in the municipalities of Cabo Rojo and Lajas, the Guánica State Forest, Almácigo Bajo Ward in Yauco, Peñuelas and Vieques. An additional individual has been reported from the Cabo Rojo National Wildlife Refuge, in Cabo Rojo, adjacent to the Sierra Bermeja. Approximately 200 individuals are known from these locations (Breckon and Kolterman 1994, Salguero-Farías, personal communication).

4.2.4.3. Current Conditions

Currently the species is only known from less than ten localities; therefore, the risk of extinction is extremely high. In the Sierra Bermeja the population occurs on privately owned land which is currently subject to intense pressure for residential and tourist development. Land clearing for grazing has destroyed some habitat which may have been occupied by this species. In addition, fire in the dry southwest is common, particularly during the drier months. A population of more than 100 individuals was reported in 1999 in Almácigo Bajo Ward, Yauco and is threatened by fires.

4.2.4.4. Summary of Impacts

Eugenia woodburyana has not been recorded in the action area; therefore there are no expected impacts on this species by the Proposed Project. One individual of this species was observed in the vicinity of the action area. This individual is near a PREPA ROW of the power lines that cut across the action area which could be affected due to maintenance activities by PREPA. (See Appendix 2: Endangered Species Field Study).

4.2.4.5. Indirect, Interdependent, Interrelated and Cumulative Effect

No indirect and interdependent impacts are expected to be associated with proposed action. Interrelated and cumulative effects are expected to be associated to the current loss and fragmentation of forest within *Eugenia woodburyana* habitat. Several

residential and industrial developments are being planned and constructed in the vicinity of the action area.

4.2.4.6. Conservation Measures and Recommendations

No specific conservation measures are proposed for this species.

4.2.4.7. Conclusion

Based on the significance criteria outlined in Section 3.0 of this BA, and the information contained herein, the Applicant has determined the proposed action would not affect *Eugenia woodburyana* in the action area.

5.0 Conclusion and General Recommendations

The purpose of conducting a BA is to consider all Threatened and Endangered species identified in the Project action area and to determine whether the proposed development site contains habitat for any such species. Three endangered species were found in the vicinity of the action area Bariaco, Vahl's boxwood, and the Puerto Rican Nightjar. A fourth listed species, *Eugenia woodburyana* (one individual) was found in the vicinity yet outside (< 400 m) of the action area in Peñuelas. Other candidate or listed species reported for the vicinity of the action area (Brown Pelican, Yellow-shouldered Blackbird, and *Cordia rupicola*) were not observed.

Based on the analysis contained in this BA, the Proposed Project "Gasoducto del Sur" would affect, not likely to adversely affect ecologically sensitive areas were the Puerto Rican Nightjar habitat was determined at the municipalities of Peñuelas and Ponce. Those vicinity areas contain endangered species protected by the Commonwealth and Federal laws. Due to the nature of the Proposed Project there are some environmental impacts that could not be prevented, for this reason it is recommended to fulfill protective measures to minimize those impacts.

The following are the most critical findings and recommendations of the Biological Assessment which require preventive and mitigation measures:

- Lands at the municipalities of Peñuelas and Guayanilla, which fulfill those habitat characteristics important for the Puerto Rican Nightjar, will be acquired for perpetual conservation. The acquisition and conservation of similar land or habitat for the species, where similar ecosystems are found, is recommended and is likely to increase the chances that the species will remain as a viable population in the area. Proposed mitigation measures to avoid, lessen, and offset these impacts and impacts to designated critical habitat include, but are not limited to, the enhancement and recovery of the Puerto Rican Nightjar population at an area identified as El Convento Caves Complex by consolidating land ownership by the purchase of land to be managed by DNER or the Puerto Rico Conservation Trust.
- PREPA will minimize impact on the Puerto Rican Nightjar habitat reducing working area impacts with innovate and best construction procedures implemented by the contractor;

placing fencing in critical locations as project limits and near areas where endangered species of plants were observed; providing education to all civilian, and contractor personnel visiting the proposed project area. These proposed conservation and mitigation measures will work to offset the effects of the Proposed Project and aid in the long-term recovery of the species.

- It is necessary to have an expert (Field Biologist) during the construction period to identify those endangered species in the Peñuelas – Ponce Area, which is the location where threatened and endangered species were observed and documented. The Field biologist will train the personnel working on the project to recognize the endangered flora and fauna, and instruct them on the importance and legal status of those species.
- For the Puerto Rican Nightjar, it is important to realize inspections at the area previous to any land movement. Any activities of the species need to be documented. These reports need to be submitted to the related agencies, as the USFWS and DNER.
- Any removal or clearing of natural habitat should be made in compliance with the New Law of Puerto Rico Wildlife (known as, Nueva Ley de Vida Silvestre de Puerto Rico, Ley Núm. 241 del 15 de agosto de 1999). Any vegetation removal on sensitive areas will be performed out of the breeding season of the Nightjar. This should be done in coordination with the DNER and USFWS.
- It is important to minimize the generation of garbage at the Project area and vicinities. The non hazardous waste generated by the employees will be collected in trash bags, and then placed in trash cans for later disposal in an approved landfill. A company will be hired to provide portable sanitary services. This company will also be in charge of the waste disposal and cleaning of any waste spill produced.
- Chemical products based on epoxy, oils, lubricants and fuels will be used during construction phase. The handling of those chemicals will be delegated to experienced personnel. This type of waste will be separated from other construction waste (non-hazardous). The disposal of those products will be done conforming to the laws and regulations. Any activity of disposal of chemical or hazardous waste will be done by the coordinator of environmental affairs of the Proposed Project in coordination with the Chemical and Waste Management Department of PREPA. Before the disposal of any

solid waste, a Full RCRA analysis will be performed to identify if those are hazardous or toxic. An MSDS analysis will be use to validate the findings.

- Also, it is important to maintain all material storage out of the construction areas especially if these are identified as ecologically sensitive. The material removed during the land clearing and leveling phase of the right-of-way will be place in dump-trucks and will be disposed in an approved landfill. The trucks will use covers to minimize the fugitive dust emissions. The material remove during the trench excavations will be stored to be reused during trench filling and restoration phase. The areas use for soil storage will have implemented a sedimentation and erosion control plan. The reuse of soil to fill trenches and restore the right-of-way reduces the impact of the project in the landfills and over the quarries, keeping the integrity of the lands at the Proposed Project area.
- As part of pre-construction procedures, the Contractor shall present his proposed plans and schedules for protection of the ecologically sensitive areas and minimize impacts, in accordance with the requirements of this section and the construction plans.
- Placing temporary barriers to delineate the area that will be developed and minimizing contact between the construction work and adjacent biological resources should be considered as protection measures.
- The risk of a fire danger during pipeline construction is related to smoking, refueling activities, operating vehicles, and other equipment off roadways, welding activities, and the use of flammable liquids. During pipeline operation, risk of fire is primarily from unauthorized entry onto the right-of-way. During maintenance operations, risk of fire is from smoking, use flammable liquids, operation of vehicles, and pipeline maintenance activities that require welding. It is important to PREPA and its contractors to establish a Fire Prevention and Suppression Plan to ensure that fire prevention and suppression techniques are carried out in accordance with federal and local regulations. The purpose of the fire prevention plan is to present actions that will be followed in order to avoid fire and ensure public safety. This plan should be implemented on all projects areas as the right-of-way, access roads, temporary use areas or storage areas, and all other used areas during construction of the Propose Project. PREPA and the contractor need to understand and be familiar with this plan and its contents prior construction activities. Also, PREPA need to contact all agencies, like the Fire Department of the area and the

environmental related agencies to ensure that all actions and permits under federal and local laws, ordinances and regulations pertaining to fire are approved. All constructions employees need to be apperceiving of the location of the firefighting equipment, their responsibilities and coordination, as part of safety training and emergency practice drills.

- The Applicant has reviewed the existing information regarding the current conditions of Bariaco, Vahl's boxwood, Yellow-shouldered Black bird, Puerto Rican Pigeon, Brown Pelican, *Cordia rupicola* and *Eugenia woodburyana* an considered the expected impacts to these species and concluded that the proposed action **would not affect** all those species.
- For the Puerto Rican Nightjar, after reviewing the existing information regarding the current condition of the species and their habitat, concluded that the proposed action **would affect, not likely to adversely affect**. The proposed mitigation actions for the Puerto Rican Nightjar and their habitat would ensure the continued existence of these species in the general area of the Project and at the propose mitigation area at the municipalities of Guayanilla and Peñuelas. In order to pursue the proposed mitigation actions the Applicant would prepare and implement a detailed management plan in coordination with the agencies as required.

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Appendix 1

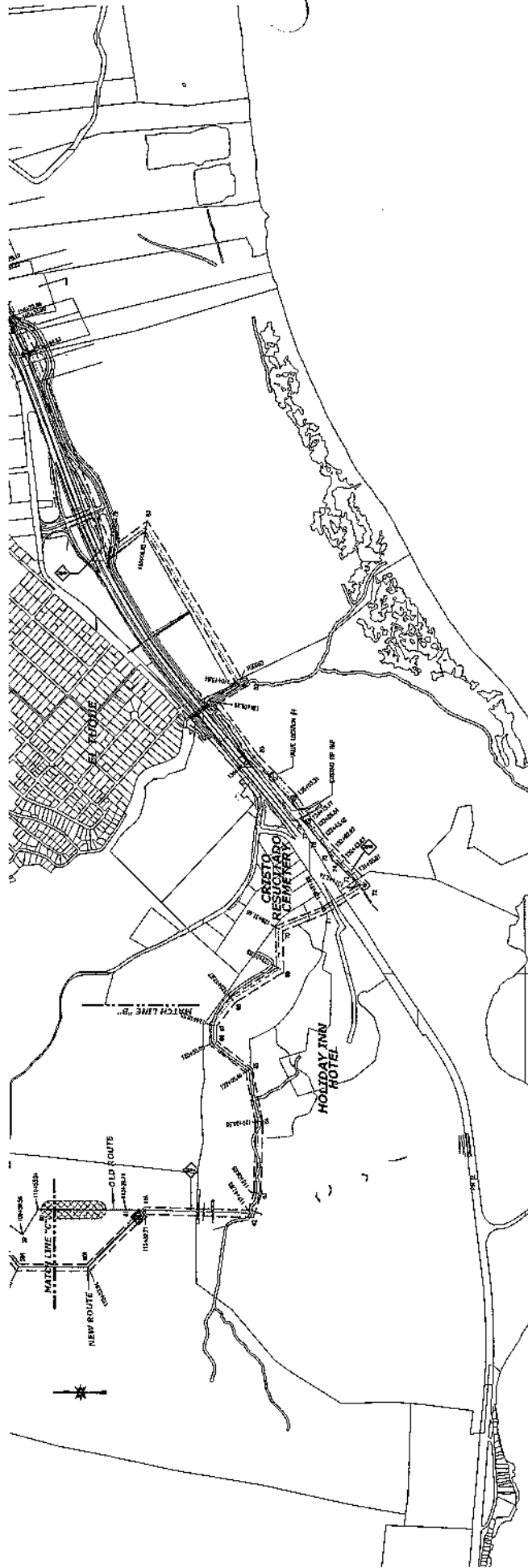
Aerial Photo of the Project Area, Page I and II

Topographic map of the Project Area, Page I and II

Environmental Sensitivity Index Map, Page I and II

Appendix 2

ALPHA ENGINEERING CONSTRUCTION PLANS AT PEÑUELAS – PONCE AREA



LEGEND

- PROPOSED ALIGHMENT/ROUTE
- EXISTING LOT ROAD
- TURNING ROW (25.00 METERS)
- EXPANDED CONSTRUCTION ACCESS AREA (NEAR METERS)
- ENVIROMENTALLY PROTECTED AREA

NOTES:

- 1) EXISTING PROPERTY MORGAN INFORMATION PROVIDED BY PREPA.
- 2) ORIGINAL ALIGHMENT STREET INFORMATION PROVIDED BY TRADON
- 3) NEW ALIGHMENT INFORMATION ROUTE CHANGES AS PROVIDED BY PREPA AND SUBMITTED BY ANTONIO REYES REYES ASSOCIADOS P.A.C.
- 4) NEW CONSTRUCTION ACCESS AREA TO BE LOCATED WITHIN THE PERMITEE TEMPORARY ROW OF RFT, AND EXPANDED TO 15FT, WHERE SHOWN.

REVISIONS

NO.	DATE	BY	CHK	APP	DESCRIPTION
1					
2					
3					
4					
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PREPA Gasoducto del Sur
PREPA ACCESS & CONSTRUCTION AREA PLAN
(PEÑUELAS - PONCE ROUTE)

SCALE: 1"=100' (1"=30.48M)
 DATE: 12/15/11
 DRAWN BY: JLM
 CHECKED BY: JLM
 APPROVED BY: JLM
 TITLE: PREPA ACCESS & CONSTRUCTION AREA PLAN

REVISIONS

NO.	DATE	BY	CHK	APP	DESCRIPTION
1					
2					
3					
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5					
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8					
9					
10					

Appendix 3

Letter from USFWS



United States Department of the Interior



FISH & WILDLIFE SERVICE

Boqueron Field Office

Carr. 301, KM 5.1, Bo. Corozo

P.O. Box 491

Boqueron, PR 00622

OCT 15 2007

Ms. Madeline Ramos
Environmental protection and Quality Assurance Division
PR Electric Power Authority
P.O. Box 364267
San Juan, Puerto Rico 00936

Re: Endangered Species Field Study
Gasoducto del Sur

Dear Ms. Ramos:

Thank you for providing us with a copy of the Endangered Species Field Study from mile 2.1 to 7.3 for the route between Peñuelas and Ponce of the proposed Gasoducto del Sur project, and for organizing the field visit conducted on October 2, 2007. The purpose of this letter is to follow-up the issues discussed during the visit by Service biologist Marelisa Rivera and to continue providing technical assistance to your agency for the Section 7 consultation with the U.S. Corps of Engineers.

The report prepared by the CSA Group summarizing the findings of the endangered species surveys is very well written. Field surveys were conducted by from July 18, August 21 to 23 and September 7, 2007 for plants. Additionally, nightjar surveys were conducted on October 18, 2006, between February 19 and 26, 2007, July 18, August 21 and September 7, 2007. During the surveys three endangered plants: *Buxus vahlii*, *Trichilia triacantha*, and *Eugenia woodburyana* were documented. *Buxus* and *Trichilia* were found within the proposed right of way of the pipeline. *Eugenia woodburyana* was found in the area, but not in the proposed right of way. Based on the results of the study, the proposed alignment would result in the destruction of three adults of *Trichilia triacantha* located at the north slope of the hill at mile 2.5, and approximately 374 adult plants of *Buxus vahlii* located at the end of mile 5 of the project. It is important to notice that since the surveys were conducted only along the proposed right of way; both the number of plants in the area and the individuals to be affected by the other components of the project (e.g. storage areas, access roads, parking, temporary offices) may be underestimated. The study also documented effects to individual plants from cutting during land surveying activities and power line maintenance.

The study revealed that the proposed project would affect approximately 77.09 acres of nightjar habitat. During the surveys a total of 55 male nightjars were detected for an average of 4.58 birds per observation point. The report established that the project may affect 45.5 male nightjar "territories" in the area.

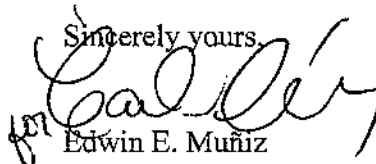
As recommended in the study, the Authority needs to develop alternatives to minimize possible adverse effects to both plants and nightjars within the project area. We concur with the study findings that transplanting adult plants is not feasible because of the characteristics of the soils and size of the individuals. Furthermore, these populations are very healthy. We documented flowers, fruits and recruitment of seedlings in the area. As we mentioned before, alternatives should be developed to avoid, minimize and compensate the anticipated adverse effects to endangered species. Such alternatives may include utilizing an alternative route such as along the existing highway PR-2, or moving the proposed alignment to already disturbed areas within the project area to protect both the endangered plants and nightjar habitat and individuals.

The U.S Army Corps of Engineers, as a Federal agency is required under Section 7(a)(1), in coordination with and with the assistance of the Service, to utilize their authorities in furtherance of the purpose of the ESA by carrying out programs for the conservation of listed species. Section 7(a)(2) of the ESA also requires each Federal agency to consult with the Service regarding effects to their actions to insure that the continued existence of listed species is not jeopardized and that designated critical habitat is not likely to be destroyed or adversely modified. This last section is commonly known as the section 7 consultation process. The anticipation of adverse effects, triggers formal consultation between the Federal agency and the Service. The formal process starts with a complete initiation package which may include a Biological Assessment or Biological Evaluation. As part of the consultation package, all effects should be analyzed and site/species specific conservation measures should be developed and incorporated into the project to minimize or offset adverse effects.

The Authority has identified possible adverse effects to listed species and needs to develop site/species specific conservation measures to minimize anticipated adverse effects. Once these measures are developed, they should be presented to the Corps to be incorporated into the consultation.

Based on the above, we cannot recommend that a permit be issued for this project as currently proposed. Thanks you for the opportunity to provide additional comments. If you have any questions, please call Marelisa Rivera at 787-851-7297 extension 231.

Sincerely yours,



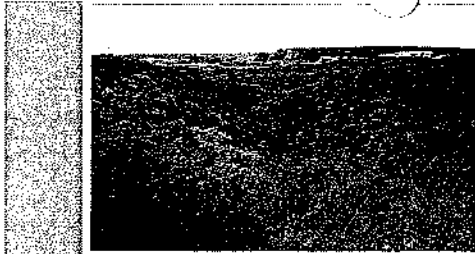
Edwin E. Muñiz
Field Supervisor
Caribbean Field Office

Mtr

Cc: COE, San Juan

Appendix 4

Endangered Species Field Study from mile 2.98 to 7.98



USACE #: SAJ-2006-7931 (IP-DD)



Endangered Species Field Study from mile 2.98 to 7.98 "Gasoducto del Sur"

Municipalities of
Peñuelas and Ponce, Puerto Rico



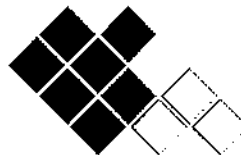
Prepared for:



Puerto Rico Electric Power Authority



Prepared by:



CSA Group
CSA, Architects and Engineers, LLP



September 2007
Revised January 2008

TABLE OF CONTENTS

1.0	EXECUTIVE SUMMARY	4
2.0	INTRODUCTION	7
3.0	ECOLOGICAL DESCRIPTION OF THE STUDY AREA FOR THE PROPOSED PROJECT	9
3.1	Climatology.....	9
3.2	Hydrology	9
3.3	Topography	10
3.4	Soil Description and Classification	10
3.5	Ecological Life Zones.....	10
3.6	Natural Reserves at the Study Area	12
3.7	Vulnerable, Critical, Threatened and Endangered Species at the Study Area.....	12
4.0	PROJECT DESCRIPTION	14
4.1	Project Purpose and Need	14
4.2	Description of Existing Conditions	15
4.2.1	Project Description	15
5.0	ENDANGERED SPECIES STUDIED	18
5.1	PUERTO RICAN NIGHTJAR (<i>CAPRIMULGUS NOCTITHERUS</i>)	18
5.1.1	Species Description and Historical Distribution	18
5.1.2	Distribution at Project Area and Vicinities	19
5.1.3	Conservation Status	19
5.2	BARIACO (<i>TRICHILIA TRIACANTHA</i>).....	19
5.2.1	Species Description and Historical Distribution	19
5.2.2	Distribution at Project Area and Vicinities	21
5.2.3	Conservation Status	21
5.3	VAHL'S BOXWOOD (<i>BUXUS VAHLII</i>).....	21
5.3.1	Species Description and Distribution.....	21
5.3.2	Distribution at Project Area and Vicinities	21
5.3.3	Conservation Status	22
5.4	PUERTO RICAN MANJACK (<i>CORDIA RUPICOLA</i>)	22
5.4.1	Species Description and Historical Distribution.....	22
5.4.1	Distribution at Project Area and Vicinities	23

5.4.2	Conservation Status	23
5.5	WOODBURY'S STOPPER (<i>EUGENIA WOODBURYANA</i>).....	23
5.5.1	Species Description and Historical Distribution	23
5.5.1	Distribution at Project Area and Vicinities	24
5.5.2	Conservation Status	24
6.0	STUDY METHODOLOGY	25
6.1	Review of Available Literature and Maps at the Office of Natural Heritage of the Department of Natural and Environmental Resources	25
6.2	Reconnaissance Visits.....	25
6.3	Field Work: Search for Endangered Species	25
7.0	RESULTS	27
8.0	CONCLUSIONS AND RECOMENDATIONS	32
9.0	REFERENCES	34
10.0	APPENDIXES.....	36
10.1	Satellite Image of the Project Area.....	37
10.2	Location Map.....	38
10.3	Satellite Image with location of Endangered Species at Gasoducto del Sur miles 2.98 to 7.88, Peñuelas and Ponce	39
10.4	Environmental Sensitivity Map.....	40
10.5	Photographic Documentation	41

1.0 EXECUTIVE SUMMARY

- The Puerto Rico Electric Power Authority (PREPA) proposes the construction of the “**Gasoducto del Sur**” which would be located in the municipalities of Peñuelas, Ponce, Juana Díaz, Santa Isabel and Salinas. The main components of the proposed Project include an underground pipeline, two (2) gas flow meters and a PIG (a tool used to provide inspections, measures and cleanings) and Launcher and Receiver.

The Gasoducto del Sur is PREPA’s priority project for fuel diversification in the process of generating electricity. For this reason, PREPA is proposing the construction of a 42.4 -mile 20” diameter steel pipeline in southern Puerto Rico along the municipalities of Peñuelas, Ponce, Juana Díaz, Santa Isabel and Salinas, to supply natural gas from the Peñuelas Ecoelectric Plant to the Aguirre Combined Cycle (ACC) in Salinas. The use of natural gas will provide greater efficiency to the operations of PREPA and will help in the management of energy costs. Also, this reduces the dependency of petroleum and the environmental impact of atmospheric pollution. The Gasoducto del Sur will impact private and public lands, currently used for commercial, industrial and agricultural purposes.

PREPA contracted CSA Architects and Engineers, LLP. (CSA) services for the conducting an Endangered Species Field Study (the Study), required as part of the Biological Assessment for the pipeline section from mile 2.98 to mile 7.98. The Endangered Species Field Study was done because during field visit for the Flora and Fauna Study three (3) endangered species were identified at the Project right-of-way. This study presents the findings of Endangered Species Field Study at the project alignment. The locations, amounts and status of those species mentioned above were included. Also this document will address all the issues presented in the United States Fish and Wildlife Service (USFWS) letter dated on May 29, 2007 related to endangered species (SAJ-2006-7931 (IP-DD)). The USFWS recommends that this study also search the species: Vahl’s boxwood (*Buxus vahlii*), Bariaco (*Trichilia triacantha*), Puerto Rican Nightjar (*Caprimulgus noctitherus*, PRN), Puerto Rican Manjack (*Cordia rupicola*) and Woodbury’s Stopper (*Eugenia woodburyana*).

The study area is located in one of Puerto Rico’s driest ecological life zone which is classified as Subtropical Dry Forest by Ewel and Whitmore (1973). This region’s typical vegetation is mostly xerophytic,

that is, deciduous forest with low-height trees and shrubs and abundance of thorny species. The leaves tend to be small, coriaceous, or succulent.

The vegetation found at the area under study for the proposed Gasoducto del Sur is typically of a native Subtropical Dry Forest. This land is occupied by a great diversity of plants and animals associated with this ecosystem. A total of 284 plant species were previously identified through the flora and fauna study and two other species, *Chionanthus holdridgei*, *Passiflora murucuja* and *Byrsonima lucida*, were identified at the project area after the endangered species study field visits, for a total of 285. The topography at the study area has a profound effect in its floristic composition which can be divided in three main habitats: dwarf subtropical dry forest, semi-open-spiny scrubland and a semi-deciduous dry forest.

The fauna in the Ponce-Peñuelas study area consists of a total of 61 species of vertebrates, mostly birds with a total of 52 species, including the endangered Puerto Rican Nightjar (*Caprimulgus noctitherus*). As to the herpetofauna, a total of 9 species of amphibians and reptiles were found, among them the common coqui frog (*Eleutherodactylus coqui*), the white-lipped frog (*Leptodactylus albilabris*), and some species of lizards (*Anolis* spp.), the common siguana (*Ameiva exsul*), and the blue-tailed siguana (*Ameiva wetmorei*).

As a result of the field visits to the proposed project area between mile 2.98 and 7.98, the endangered species *Buxus vahlii* and *Trichilia triacantha* were found at the Project right-of-way. A total of three (3) individuals of Bariaco (*Trichilia triacantha*) and 378 individuals of Vahl's boxwood (*Buxus vahlii*) were identified in the Proposed Project right-of-way during field visits on August 20 -23 and September 7, 2007. Also, other visits were performed at the area during October 30 and 31, 2007, to locate a possible new right of way to minimize the impact to Vahl's boxwood. On those days a total of 30 individuals were identified west to actual right of way between mile 6.5 and 7.0. The right-of-way has been modified to avoid impacting Vahl's boxwood and Bariaco individuals (see figures with Proposed Project Right-of-way at the Appendix).

Cordia rupicola and *Eugenia woodburyana* were not found at the Project's right-of-way. *Eugenia woodburyana* was observed at the vicinity of the Project north of Las Cucharas Penitentiary and near PREPA power lines, but not in the Project right-of-way.

Also the Puerto Rican Nightjar (*Caprimulgus noctitherus*) was observed and heard at the Project right-of-way during the field visits throughout mile 2.98 to 7.88 during field surveys on February 19-23 and 26, 2007

and additional observations on October 18, 2006 and July 18, August 21 and September 7 of 2007. Data collected during these surveys indicate that approximately 45.5 male Puerto Rican Nightjars inhabit the Project area.

This document presents the findings of the Endangered Species Field Study as part of the Biological Assessment Studies of the Proposed Project "Gasoducto del Sur".

2.0 INTRODUCTION

- The Puerto Rico Electric Power Authority (PREPA) proposes the construction of the Gasoducto del Sur (the Gaseoduct), which would be located in the municipalities of Peñuelas, Ponce, Juana Díaz, Santa Isabel and Salinas. The main components of the proposed gaseoduct consist of an underground pipeline, two (2) gas flow meters and a PIG (a tool used to provide inspections, measures and cleanings) and PIG Launcher and Receiver.

The Gaseoduct is a priority project for PREPA in its initiative for fuel diversification in the process of generating electricity. For this reason, PREPA is proposing the construction of a 42.4-mile 20" diameter steel pipeline in southern Puerto Rico along the municipalities of Peñuelas, Ponce, Juana Díaz, Santa Isabel and Salinas to supply natural gas from the Peñuelas Ecoelectrica Plant, to the Aguirre Combined Cycle Plant in Salinas. The project will impact private and public lands used actually for commercial, industrial and agricultural purposes.

PREPA contracted CSA Architects and Engineers, LLP. (CSA) services for the preparation of the Endangered Species Field Study required as part of the Biological Assessment for the pipeline section from mile 2.98 to mile 7.88 (the Project) near road PR-2. The project right-of-way is proposed specifically at a mountainous area at Peñuelas and Ponce. The approximate coordinates (NAD 83) of the beginning and end of the project are (respectively):

- | | |
|--------------------------------|------------------------------|
| 1. Latitude - 18° 00' 00.09698 | Longitude - 66° 43' 15.83276 |
| 2. Latitude - 17° 58' 42.15670 | Longitude - 66° 39' 58.07933 |

The purpose of this study is to locate, evaluate, count and describe critical, threatened or endangered species in these areas; and to recommend measures to reduce or eliminate the impacts of the Gaseoduct on those resources. This document contains the following sections:

- Ecological Description of the Study Area;
- Project Description
- Study Species
- Study Methodology;
- Results

- Conclusion and Recommendations; and
- Supporting Appendixes.

The following biologist CSA staff was involved in the field visits for this study on August 21 to 23 and September 7, 2007:

- Mariely Morales, M.Sc.,
- José A. Salguero, M.Sc.,
- David Rosa, B.Sc.,
- Agustin Lizardi, B.Sc.,
- Cheryl Batista, M.Sc., and
- Jose L. Ramirez, B.Sc.,

Finally, CSA's Department of Geographic Information System (GIS) staff provided additional support in the report's preparation and Jose A. Salguero, Technical Leader., CSA Senior Scientist, revised the manuscript and provided technical support.

3.0 ECOLOGICAL DESCRIPTION OF THE STUDY AREA FOR THE PROPOSED PROJECT

- This study was conducted in the municipalities of Peñuelas and Ponce. The proposed site in Peñuelas - Ponce is bounded by undeveloped lands of Subtropical Dry Forest (Appendix 1, Figure: Satellite Image of the Project Area).

3.1 Climatology

- In the region between Peñuelas and Ponce the climate is representative of Puerto Rico's southern coast, with prevailing east-southeast winds, high temperatures and scarce rainfall in the low-lying zones but more abundant rain in the mountains of the interior.
- Table 1: Average temperature for the area based on NOAA Station Ponce 4E (667292):

Municipality	MONTHS												Annual
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ponce	76.4	76.4	76.8	78.3	80.1	81.6	82	82	81.4	80.8	79.2	77.3	79.3

- Table 2: Average Total Precipitation (Inches) for the area base on NOAA Stations Ponce 4E (667292) and Peñuelas (666983):

Municipality	MONTHS												Annual
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ponce	0.94	0.98	1.47	2.18	3.82	2.46	2.58	4.20	5.59	6.18	3.86	1.34	35.63
Peñuelas	2.16	2.07	2.46	3.73	5.22	3.06	3.06	5.25	8.99	9.54	6.14	2.70	54.36

3.2 Hydrology

- The Project study area crosses a number of hills in the Tallaboa area. Natural drainage patterns have maintained three intermittent creeks, two intermittent that cross east of the Peñuelas-Ponce municipal boundary and a third that lies near mile 3.0 of the proposed Gaseoduct. At the moment

of the study those creeks were dry. In addition, there are several artificial and natural drainage channels that influence hydrology in the area, such as the many stormwater runoff, canals which flow into the coastal salt flat system and the Caribbean Sea through Road PR-2.

3.3 Topography

Topography in the Project region includes steep topography of the central mountain range (Appendix 2, Figure 2). At the study area, the topography is characterized by weathered limestone soils forming a hilly landscape with sharp drop-offs.

3.4 Soil Description and Classification

- The right-of-way where the proposed facilities will be located are in the mountainous area within the municipalities of Peñuelas and Ponce. Following is a description of soils by region and in the specific study area. It is based in the Natural Resources Conservation Service (NRCS) of the soil survey for the south region (Gierbolini, 1979).
- The soil associations for the study area correspond to semiarid areas (Gierbolini, 1979). Toward the area of Peñuelas, the soil association is the Aguilita type. This association is characterized by steep to very steep, well drained, on foot slopes, side slopes, and rounded hilltops in the semiarid areas. Specifically the type on the Peñuelas area is Aguilita stony clay loam (AhF) with 20 to 60 percent slopes. It is similar to the typical of the series, except that stones and rocks cover 40 to 60 percent of the surface area. Soil runoff is very rapid and erosion is a major hazard.
- In the Ponce area, the identified soil association is the Yauco type. These soils consists of well drained, calcareous, gently sloping and strongly sloping soils, on rounded hills and foot slopes below the limestone hills in the semiarid area. Slopes range from 2 to 12 percent. This soil is form with moderately fine textured sediments that was derived from limestone. Specifically at the study area we find the Yauco silty clay loam (YcC) with 5 to 12 percent slopes. The soil is similar to the typical of the series, except it has a slightly thinner surface and subsoil. Runoff is of medium intensity and erosion is a hazard

3.5 Ecological Life Zones

- The Project is located in one of the driest ecological life zones in Puerto Rico (Ewel and Whitmore, 1973). Ewel and Whitmore (1973) classify this area as a Subtropical Dry Forest. Many of Puerto

Rico's dry forests are found in the humid to dry transition zone of this ecological zone. Average annual rainfall for this life zone ranges between 600 and 1,100 mm. Typical vegetation in this region is mostly xerophytic, that is, a deciduous forest with low-height trees and shrubs species. Leaves tend to be small, coriaceous or succulent, with an abundance of spiny species.

According to Ewel and Whitmore (1973), the most common species found in this life zone include: gum tree (*Bursera simaruba*), mesquite (*Prosopis juliflora*), lignum vitae (*Guaiacum officinale*), wild tamarind (*Leucaena leucocephala*), tamarind (*Tamarindus indica*) and genip (*Meliococcus bijugatus*). On the other hand, forests in this life zone have more diversity and a larger number of species than forests in more humid zones.

The topography at the Project area has had a profound effect in its floristic composition which can be divided into different habitats: palm forest, dwarf subtropical dry forest, semi-open-spiny scrubland and a semi-deciduous dry forest, agricultural lands, herbaceous and forested wetlands, and commercial and urban areas.

The palm forest is characterized by a dominant species *Thrinax morrissii*, which is locally common on dry limestone hills and cliffs of study area. Other species found on this type of forest is the Pockhout (*Coccoloba mycrostachia*), velvet seed (*Guettarda elliptica*), candle berry (*Byrsonima lucida*), spanish stopper (*Eugenia foetida*), wild cherry *Crossopetalum rhacoma* and Cock's spur (*Comocladia dodonaea*).

The dwarf subtropical dry forest is characteristic of windward hills found at the higher elevations of the study area. Typical species of this habitat include small trees and shrubs such as torchwood (*Amyris elemifera*), cucubano liso (*Guettarda elliptica*), tachuelo *Pictetia aculeata*, pigeon berry (*Bourreria succulenta*), *Croton discolor*, jack-switch (*Corchorus hirsutus*), biriji (*Eugenia foetida*), West Indian elm (*Guazuma ulmifolia*), *Hibiscus phoeniceus*, and twisted acacia (*Acacia tortuosa*).

At the semi-open-spiny scrubland areas the prevailing families are grasses (Poaceae), sedges (Cyperaceae), Fabaceae, Malvaceae, Myrtaceae and Euphorbiaceae. Typical species include sweet acacia (*A. farnesiana*), castor bean (*Ricinus communis*), *Sesbania bispinosa*, and mesquite (*Prosopis juliflora*). The dominant grasses are guinea grass (*Urochloa maxima*), and *Uniola virgata*. Vines such as *Galactia dubia*, *Rhynchosia minima*, *Pueraria phaseoloides*, and *Stigmaphylum emarginatum* were also observed at those areas.

The semi-deciduous dry forest is the most prominent vegetation association found at the foot slopes of hills at the Tallaboa area. At this area is common to find bigger trees with a more dense forest cover than in the other habitats described above as more mesic conditions prevail. Common species found at the area include, lignum vitae (*Guaiacum officinale*), *Commocladia dodonaea*, gum tree (*Bursera simaruba*), wild cinnamon (*Canella winterana*), broad-leaved caper (*Capparis hastata*), oxborn bucida (*Bucida buceras*), hoja menuda (*Eugenia biflora*), and pockout (*Coccoloba microstachya*). At the understory different Myrtaceae and Sterculiaceae were also observed.

3.6 Natural Reserves at the Study Area

No forests, refuges or natural reserves or other natural protected areas were identified in the Project areas, or in a radius of 400 meters. The nearest ecologically high valuable area is the Guayanilla Hills, at the northwest of the study area at a distance of approximately 2.5 miles from the Project study area, according to the region's topographic quadrangles. Since the past century, the lowland valleys surrounding the hills have been cleared and converted to agriculture. Above the valleys, the forest of the Guayanilla Hills does not appear to have been disturbed recently, although it was selectively lumbered and cut for charcoal during the 1800's (Vilella and Zwank 1987). Raffaele and Duffield (1979) recognized the Guayanilla Hills as an important conservation area, due to the presence of the endangered Puerto Rican Nightjar, as one of the island's prime wildlife areas. In 2004, BirdLife International and the Sociedad Ornitológica Puertorriqueña Inc. (SOPÍ) recognized the Guayanilla Hills as an Important Bird Area. Today, it stills is considered an important habitat for the endangered Puerto Rican Nightjar and continues to be classified as a prime Critical Wildlife Area (CWA) by the Department of Natural and Environmental Resources (DNER). Also the NOAA Environmental Sensitivity Index Map delimited the area has Puerto Rican Nightjar habitat (See figure: Environmental Sensitivity Index Map).

Also, at the Project footprint two endangered species were found, the Bariaco (*Trichilia triacantha*) and Vahl's Boxwood (*Buxus vahlii*).

3.7 Vulnerable, Critical, Threatened and Endangered Species at the Study Area.

According to the DNER's Heritage Program Critical Species Inventory, in the Project area in Guayanilla-Peñuelas there are species considered as critical elements, vulnerable, threatened critical or endangered within a radius of 400 meters from the proposed Project. During this study the CSA team was able to

locate thirteen (14) plant and two (2) faunal species considered as critical elements by the Department of Natural and Environmental Resources (DNER). The concern plant species documented in this study are Hollywood lignum vitae (*Guaiacum sanctum*), cachimbo peludo (*Rondeletia pilosa*), black torch (*Erithalis fruticosa*), juso (*Rochefortia acanthopora*), Vahl's boxwood (*Buxus vahlii*), *Chamaesyce cowelli*, red anneslia (*Caliandra haematomma*), *Chamaecrista glandulosa*, bariaco (*Trichilia triacantha*), *Polygala penaea*, break hill (*Sideroxylon obovatum*), Woodbury's stopper (*Eugenia woodburyana*), *Passiflora murucuja* and *Cissus obovata*. Among these plant species, three (3) are classified as endangered Bariaco, Woodbury's stopper and Vahl's boxwood. The endangered Puerto Rican Nightjar (*Caprimulgus noctitherus*) and the data-deficient blue-tailed siguana (*Ameiva wetmorei*) were the two (2) faunal species considered as endangered and critical species, respectively, by the DNER.

4.0 PROJECT DESCRIPTION

4.1 Project Purpose and Need

The Gasoducto Del Sur is a priority project for PREPA in its initiative for fuel diversification in the process of generating electricity. For this reason, PREPA is proposing the construction of a 42.4-mile, 20" diameter steel pipe gaseoduct in southern Puerto Rico along the municipalities of Peñuelas, Ponce, Juana Díaz, Santa Isabel and Salinas to supply natural gas from the Peñuelas' Ecoeléctrica Plant, to the Combined Cycle Plant (CCP) in Salinas. The use of natural gas will provide more efficient operations for PREPA and will help in the management of energy costs. Also, this reduces the dependency on petroleum and the environmental impact of atmospheric pollution. The Project will impact private and public lands presently used for commercial, industrial and agricultural purposes. Also, some forested areas and pastures will be directly impacted by the Project construction and operation (See Figure 1: Aerial Photograph and Figure 2: Topographic maps).

- The proposed pipeline will require a 120-foot wide impact zone along the 42.4-mile extension of the Project. The pipeline will require the construction of a trench for a 20" pipeline. An estimated 478.1 acres, approximately, of commercial, industrial, agricultural, forested, and wetland areas will be impacted due to land clearing and excavation activities. PREPA will follow all recommendations made by inherent agencies regarding endangered species, wetland and mangroves protection.
- Forty-seven (47) water bodies will be crossed using methods such as Horizontal Direct Drilling (HDD, will be use for all rivers) and open trench (will be used for all creeks at the Project site).

The foremost justification for the development of the GDS in Puerto Rico is the need of alternative fuel sources for power generation. The use of natural gas is the most viable option contemplated by PREPA at this moment. In the south area of Puerto Rico is located the first project in the island of that kind, the Ecoeléctrica Plant at Peñuelas. Ecoeléctrica is one of six (6) natural gas import terminals in the United States. At present, PREPA is evaluating other energy sources, including renewable energy sources, but these cannot supply large amount of electric energy to satisfy Puerto Rico's actual energy demand.

4.2 Description of Existing Conditions

The environmental baseline is an analysis of the past and present human and natural factors leading to the current status of listed species or their habitats and ecosystems within the proposed *action area*. For the purposes of this study, the *action area* is defined as the southern land portion corridor extending approximately 6 miles from mile 2.98 to 7.88 of the proposed right-of-way at the municipalities of Peñuelas and Ponce.

Southern Puerto Rico region underwent numerous man-made alterations, mainly from the heavy industries established around the area during the decades of 1950 through 1970's. Through all those years, most of the industrial development at the Project area is related to heavy industries of bulk crude oil established around Guayanilla Bay in Peñuelas and Guayanilla. At Salinas, the electrical power production continued being based on using petroleum fuels. In 1975, started the construction of the Aguirre Thermoelectric Complex, initiated with the construction on the Aguirre Power Plant with capacity of 900 Megawatts (MW) and followed in 1977 by the Combine Cycle Plant with capacity of 592 MW. At Ponce, the Port of the Americas Harbor is the second largest commercial port in Puerto Rico, with the transshipment in post-Panamax class vessels. Also, at the municipalities of Juana Diaz and Santa Isabel, different agricultural activities are being performed and those lands extend for many miles throughout the Project.

In spite of the heavy industrial and agricultural development, some areas remain in a relatively good state and retain valuable forest and, marine and estuarine resources. The forests of this life zone, at least on Puerto Rico, are richer in birds than those at wetter life zones in the island.

The *action area* contains forested areas that are known to support and provide habitat to a number of endangered species, especially in the mountainous area north of road PR-2 between Peñuelas and Ponce and the dry forest and mangroves around coastal plains along the Project. Among the endangered species that are known to occur or likely to occur in the vicinity of the Project are the Puerto Rican Nightjar, the Brown Pelican, the Yellow-shouldered Blackbird, the Puerto Rican Plain Pigeon, and the plants, Vahl's boxwood, Puerto Rican Manjack, Woodbury's Stopper and Bariaco.

4.2.1 Project Description

The Applicant's Preferred Alternative for the development of the GDS, as proposed by Puerto Rico Electric Power Authority (PREPA), includes the following elements:

- The PREPA proposes the construction of the GDS, which would be located in the municipalities of Peñuelas, Ponce, Juana Díaz, Santa Isabel and Salinas. The main components of the proposed Project consist of an underground gaseoduct, two (2) gas flow meters and a Pig (a tool used to provide inspections, measures and cleanings), a Pig Launcher and receiver. Also, the Project includes the installation of three (3) valves used to isolate the gaseoduct in case of inspection, repairs or emergencies. The Project will consist of a lineal excavation of a trench impacting 478.1 acres, approximately, of commercial, industrial, agricultural, forested, wetland areas and mangroves. The Jurisdictional Wetland Determination Study determined that 0.73 acres (0.75 cuerdas) will be permanently impacted and undetermined amount of mangrove trees along three areas adjacent to the existing PR-2. The construction of the trench will impact approximately 120 feet of right-of-way (ROW). The permanent operational ROW will be of 50 feet (25 ft to each side from the center of the trench) for service, repairs and emergencies.
- The GDS will be an underground construction. Public and private lands, currently used for commercial, industrial and of agricultural purposes will be impacted. The pipeline and all other construction materials will be shipped from the United States, and will be received at the Port of the Americas in Ponce. On the vicinities of the Port of the Americas an operations center will be maintained to storage materials, equipment and as a meeting area to discuss logistics during construction.
- The project area comprises the following municipalities (see figure 1):
 - *Peñuelas* – The Project begins at the Municipality of Peñuelas, specifically at the Union Carbide property, at road PR-337 Ht. 671, crossing Tallaboa Poniente and Encarnación Wards until the limits of the Municipality of Ponce. In Peñuelas, the Project will cover approximately 4.5 miles. The construction ROW will be 47.9 acres of which 27.2 acres will be permanent.
 - *Ponce* – The Project continues through the Municipality of Ponce, crossing Cañas, Playa, Vayas, Bucaná and Capitanejo wards, parallel at the south of road PR-1 at the limits of the Municipality of Juana Díaz. In Ponce the Project extends 13.1 miles with a construction ROW of 146.3 acres of which 79.2 will be permanent.

- *Juana Diaz* – At the Municipality of Juana Diaz, the Project crosses through Sabana Llana, Río Cañas and Citrona wards, until the vicinities of Santa Isabel, through Descalabrado Ward and Río Descalabrado. The Project will extend 6.9 miles, approximately. The construction and operation ROW will be of 76.7 and 41.7 acres (permanent impact), respectively.
- *Santa Isabel* – In Santa Isabel, the gaseoduct will cross Descalabrado, Boca Velázquez, Felicia 1, Felicia 2, Jauca 1 and Jauca 2, until the border with Salinas, through Río Jueyes. The gaseoduct will extend in Santa Isabel, 7.9 miles, approximately. The Project will have a construction and operational ROW of 101.8 and 47.8 acres, respectively.
- *Salinas* - The Project will extend 9.6 miles at the Municipality of Salinas. The Project will cross Río Jueyes and Aguirre wards. At this municipality the Project will have a construction and operation ROW 105.4 acres and 58.0 acres (permanent impact), respectively. The project ends at the Aguirre Thermoelectric Complex, Combined Cycle Plant.

5.0 ENDANGERED SPECIES STUDIED

5.1 PUERTO RICAN NIGHTJAR (*CAPRIMULGUS NOCTITHERUS*)

5.1.1 Species Description and Historical Distribution

- The Puerto Rican Nightjar (*Caprimulgus noctitherus*, PRNi) is small (8.5") nocturnal bird with long bristles about the mouth with mottled gray brown and black plumage. This nightjar is predominantly an understory bird where it feeds on flying insects and has been observed to have favorite perches, from which they sally to pursue nocturnal flying insects beneath the forest canopy seldom do they fly above the emergent trees, preferring to stay under the forest canopy. Males call throughout the year, particularly at dusk and before dawn, especially from November to May. Breeding and nesting is from late February through July, with a peak period from April to June (USFWS, 1984).
- Puerto Rican Nightjars lay their eggs directly on leaf litter under scrub vegetation, where the forest canopy ranges from four to six meters in height and usually avoids open areas or clearings. The average clutch size is two eggs. Incubation is done by both the female and the male and lasts about 20 days. After hatching, the young are able to fly around on the 14th day (USFWS, 1984).
- The Puerto Rican Nightjar was considered extinct until G. B. Reynard rediscovered it in southwestern Puerto Rico in 1961 (USFWS, 1984). This nightjar is endemic to Puerto Rico, and may be locally common through its patchy distribution. The natural history of the Puerto Rican Nightjar was poorly known until recently. The species was listed as endangered throughout its range in 1973 (Federal Register, 1973).

Puerto Rican Nightjar habitat in southwestern Puerto Rico (Vilella, 1987) consists of mature undisturbed forests representative of the Subtropical Dry Forest Life Zone (Ewel and Whitmore, 1973), where the vegetation tends to form complete ground cover, and is almost entirely deciduous on most soils. Trees usually do not exceed 15 meters in height and their crowns are typically broad, spreading and flattened with sparse foliage.

An estimated breeding population of 400 pairs (Kepler and Kepler, 1973) may be present near the Guánica and Susúa state forests. The PRN also occurs sparingly in other localities in the dry limestone forests of

the southwest coast of Puerto Rico, from Ponce to El Combate, extending north to Sabana Grande and Maricao. The most recent surveys indicate stable populations of nightjars in the Guánica and Susúa State forests and the hills in Guayanilla. Recent estimates for all populations are 712 singing male Puerto Rican Nightjars on 9,838 hectares distributed as follows: Guánica (347), Guayanilla-Peñuelas (188) and Susúa-Maricao (177) (Vilella, 1989; Vilella and Zwank, 1993). Recent studies confirm the presence of this species in the hills north of road PR-2 between Peñuelas and Ponce.

5.1.2 Distribution at Project Area and Vicinities

The PRNi is one of the endangered species known to occur within the Project site in the hills between Peñuelas and Ponce. Vilella and Zwank (1993) surveyed 2,701 hectares (ha) of Dry Limestone Forest and the study shows the presence of 188 nightjars in the Guayanilla-Peñuelas region. The study only surveyed 66% of the available nightjar habitat in the Guayanilla-Peñuelas region. Puerto Rican Nightjar were heard singing on grazed lands where the canopy was retained although in lower numbers, suggesting that Nightjars can exist on lands with some degree of disturbance (Vilella and Zwank, 1987).

Also the Puerto Rican Nightjar) was observed and heard at the Project right-of-way during the field visits throughout mile 2.1 to 7.3 during field surveys on February 19-23 and 26, 2007 and additional observations on October 18, 2006 and July 18, August 21 and September 7 of 2007. Data collected during these surveys indicate that approximately 45.5 male Puerto Rican Nightjars inhabit the Project area.

5.1.3 Conservation Status

The USFWS recognized the Puerto Rican Nightjar as endangered throughout its range in the Federal Register on June 4, 1973. Habitat destruction and modification for the construction of urban, industrial, and tourist developments are the one of the impacts on the species decline. Also introduced fauna species as the mongoose (*Herpestes jarvanicus*), may have extirpated the nightjar from those areas of its former range (USFWS, 1984). Survival of the PRN will depend on preserving and maintaining habitat, particularly in the Guánica Forest and on adjacent privately-owned lands, as well as on the privately-owned lands in the Guayanilla, Peñuelas and Ponce area.

5.2 BARIACO (*TRICHILIA TRIACANTHA*)

5.2.1 Species Description and Historical Distribution

- Bariaco (*Trichilia triacantha*) is an evergreen shrub or small tree that may reach up to 30 feet in height and 3 inches in diameter (Little et al., 1973). The alternate leaves are shiny dark green,

leathery, and clustered at the ends of twigs. Each compound leaf is 3 to 7-parted with leaflets appearing to be arranged palmate and bearing 3 stiff, sharp spines at their apex. Bariaco flowers are white, symmetrical and bisexual. Bariaco has been observed to flower from January to March in the Guánica State Forest. Flower production is abundant but fruit set appears to be poor. Pollination mechanisms are not known, although other members of this genus are wind or insect pollinated. See appendix 10.5 for Photographic documentation of the species at the Proposed Project right-of-way.

- Bariaco is endemic to the southwestern of Puerto Rico. Specifically is restricted to the dry limestone forests of this part of the Island. Extensive areas of this life zone overlie limestone, including the area in which Bariaco is found. It can be found in the deciduous and the semi-evergreen seasonal forests of the Subtropical Dry Forest Zone at elevations of less than 100 feet. Approximately 40 individuals are known to exist in two populations located in the Guánica State Forest and Punta Guaniquilla near Boquerón. One population was reported from the Guayanilla hills near Peñuelas, but has apparently been eliminated by woodcutting and road construction (USFWS, 1991). DNER personnel also found the species at the hills north to the road PR-2 (personal communication).
- These forest types where Bariaco is found, typically consist of two tree or shrub strata. Trees in the upper strata of the deciduous forest reach 10 meters in height. Common emergent species include *Bucida buceras* (ucar) and *Bursera simaruba* (almacigo). Bariaco is found in the lower strata associated with common species such as *Coccoloba microstachya* (uvillo), *Krugiodendron ferreum* (palo de hierro), *Amyris elemifera* (tea), and *Pisonia albida* (corcho). Soils in the semi-evergreen forests retain greater moisture, trees are somewhat taller and a larger number of evergreen species are found (USFWS 1991).
- Bariaco is a very rare species; it could easily be eliminated through woodcutting, construction development and other human actions. Its wood is known for hardness, durability, and color, which makes it particularly valuable for utilitarian purposes. The species has been affected in the past by deforestation, agriculture, grazing, charcoal production, and the cutting of wood for fence posts (USFWS 1991).

5.2.2 Distribution at Project Area and Vicinities

- The DNER have confirmed the presence of this species in the hills located to the north of PR-2 between Guayanilla and Ponce. No exact population estimate is available. Actually, the Department of Natural and Environmental Resources (DNER) identify approximately 21 individuals of Bariaco at the vicinities of the Project, under power lines of PREPA. This information was corroborated by CSA scientist at the field (Personal Communication with Jose Sustache, Flora specialist of DNER). Also near the 120 feet right-of-way of the project, three (3) individuals of Bariaco were found by CSA field team. Actually, the route has been modified to avoid any impact to the species at the area.

5.2.3 Conservation Status

The United States Fish and Wildlife recognized *Trichilia triacantha* in its Federal Register, as Endangered, on February 5, 1988.

5.3 VAHL'S BOXWOOD (*BUXUS VAHLII*)

5.3.1 Species Description and Distribution

- Vahl's boxwood (*Buxus vahlia*) is a small evergreen shrub or tree measuring up to 15 feet tall and 5 inches in diameter. The leaves are more or less oblong, simple, opposite and about 1.5 inches long and 0.75-inch wide. The flower cluster is small and is composed of a solitary female flower and several male flowers just below it. Flowering takes place from December to early April. This species does not reproduce vegetatively. It is found growing as an understory shrub in semi-shaded conditions in semi-evergreen seasonal limestone forests at elevations ranging from 80 to 650 ft. (USFWS, 1987). See Appendix 10.5: Photographic Appendix for photos of the species at the Proposed Project right-of-way.
- Vahl's boxwood is only known from Puerto Rico, where it has been recorded at three locations, Punta Higüero in Rincón, Hato Tejas in Bayamón, and the hills located to the north of PR-2 between Guayanilla and Ponce. In 1984, there were an estimated 16 plants at the Rincón site and 24 plants at Hato Tejas.

5.3.2 Distribution at Project Area and Vicinities

- The USFWS, DNER and this study have confirmed the presence of this species in the hills located to the north of PR-2 between Peñuelas and Ponce. No exact population estimate is available for

all the area between Guayanilla and Ponce. Actually, the Department of Natural and Environmental Resources (DNER) identified approximately 500 individuals of Vahl's boxwood at Valdivieso quarries at Peñuelas (Personal Communication with Jose Sustache, Flora specialist of DNER). At the project area between Peñuelas and Ponce, CSA scientists identified 378 individuals at the 120 feet right-of-way. (See Appendix 10.3). Actually, the route has been modified to avoid any impact to the species at the area.

5.3.3 Conservation Status

The United States Fish and Wildlife recognized *Buxus vahlii* in its Federal Register, as Endangered, on August 13, 1985. The plant should be protected in its present habitat as long as possible. Also, it is important to recognize other possible critical habitat and implement protection strategies and management practices.

5.4 PUERTO RICAN MANJACK (*CORDIA RUPICOLA*)

5.4.1 Species Description and Historical Distribution

Cordia rupicola is a small woody shrub, originally described as endemic to Puerto Rico (Britton and Wilson, 1925). *Cordia rupicola* was previously thought to be endemic to Puerto Rico, but it was reported in 1987 from the island of Anegada in the British Virgin Islands. The German botanical collector Paul Sintenis first discovered this species in 1886 at Los Indios, located between Barinas and Guayanilla, Puerto Rico. It was later found in Guánica, Puerto Rico, in 1887, and again in 1943 and 1959 (Proctor, 1991). Proctor (1994), reported a specimen from Punta Jalova, Vieques Island observed by Woodbury, possibly around 1978. Surveys conducted in 1991 did not find the species at the historical locations in Guánica and Guayanilla (Proctor, 1991).

Surveys conducted in 1995 located the species in the area of Peñuelas, an area to the east of Guayanilla, at a site called El Peñón. Approximately 15 plants of *Cordia rupicola* have been located at this site. Some plants were observed with fruit in the month of January. Other rare and endangered plants, *Eugenia woodburyana*, *Myrtus bellonis*, *Passiflora bilobata*, and *Nashia inaguensis*, are also known from that site (Breckon and Kolterman, 1996). In 2003, three (3) individuals of *Cordia rupicola* were found adjacent to a trail within the Guánica Commonwealth Forest (USFWS, 2005) though no specimens of *Cordia rupicola* were found during a survey on Vieques Island in 1995-1996, a specimen was found in 2005 on Lighthouse

Peninsula in Vieques Island (USFWS, 2005). Not more than 25 individuals of *Cordia rupicola* are known from the Puerto Rico locality (USFWS, 2005).

The species is currently known from only one area in Puerto Rico. While it has been reported from Anegada, little is known about the species on that island. The population in Puerto Rico is located on privately owned land that forms part of a residential development. Although lots are large in size, many of the surrounding lots have been completely cleared for house construction and maintenance of power lines by cutting, burning, or the use of herbicides.

One of the most important factors affecting the continued survival of this species is its limited distribution. Currently it is only known from southern Puerto Rico, on privately owned land. The site is located within the driest life zone on the island, and fires, both spontaneous and caused by man, are a frequent occurrence. In addition, damage from catastrophic events, such as hurricanes, could result in the loss of a significant number of individuals.

5.4.1 Distribution at Project Area and Vicinities

The species was not found at the Proposed Project right-of-way during the Flora and Fauna study or the Endangered Species Field Study.

5.4.2 Conservation Status

The Commonwealth of Puerto Rico under the Department of Natural and Environmental Resources has adopted a regulation that recognizes and provides a protection for certain Commonwealth listed species. However, *Cordia rupicola* is candidate for listing under the Endangered Species Act. Federal listing would also provide protection under the Endangered Species Act, and, by virtue of the existing cooperative agreement under section 6, it would ensure the species' addition to the Commonwealth list.

5.5 WOODBURY'S STOPPER (*EUGENIA WOODBURYANA*)

5.5.1 Species Description and Historical Distribution

Eugenia woodburyana is a small, evergreen tree which may reach 6 meters in height. Its leaves are opposite, obovate, pilose on both sides, glandular-punctate below, and from 1.5 to 2 centimeters long and 1 to 1.5 centimeters wide. Inflorescences are axillary, and have 2 to 5 flowers that produce a striking red fruit upon maturity, eight-winged and 2 centimeters in diameter (See Appendix 10.5: Photographic Documentation).

Eugenia woodburyana is found in the deciduous and semi-evergreen seasonal forests of the subtropical dry forest life zone of southwestern Puerto Rico at elevations of less than 100 meters. *Eugenia woodburyana* is endemic to Puerto Rico and currently known only from the Sierra Bermeja in the municipalities of Cabo Rojo and Lajas, the Guánica State Forest, Yauco (Almácigo Bajo ward) and from Vieques. An additional individual has been reported from the Cabo Rojo National Wildlife Refuge, in Cabo Rojo, adjacent to the Sierra Bermeja. Approximately 200 individuals are known from these locations (Breckon and Kolterman 1994, Salguero-Farfa, personal communication).

Extensive areas of these life zones are over limestone soils, including the area where this species is found. These forest types typically consist of two (2) tree or shrub strata.

5.5.1 Distribution at Project Area and Vicinities

The species was not found at the right-of-way of the Proposed Project during the Flora and Fauna study and also for the Endangered Species Field Study. The species was observed in the vicinities of the Proposed Project near the power lines north of Las Cucharas Penitentiary. *Eugenia woodburyana* was found on the areas where also *Trichilia triacantha* was observed out of the Proposed Project Limits (> 400 m).

5.5.2 Conservation Status

The United States Fish and Wildlife recognized *Eugenia woodburyana* in its Federal Register, as Endangered, on September 9, 1984. As shows in the species accounts, clearing of land for grazing, urban and commercial developments and power lines has destroyed some habitat occupied by this species. In addition, fire in the dry southwest is common, which become an imminent hazard at the dryer season. Currently the species is only known from three localities; therefore, the risk of extinction is extremely high (USFWS 1996).

Eugenia woodburyana populations that are found on private lands should be given protection through conservation management or acquisition of those areas. Management plans for public lands should be revised or prepared to include provisions for the protection and the recovery of the species. Propagation for introduction into protected areas for the establishment of new populations or enhancement of existing populations should be considered a priority recovery mechanism.

6.0 STUDY METHODOLOGY

- This section describes the procedures used to perform the Endangered Species Field Study. Research followed the best professional practice according to procedures accepted by the DNER and the United States Fish and Wildlife Service (USFWS), with field evaluations throughout all the Project areas, performed during several days until all areas were covered.

6.1 Review of Available Literature and Maps at the Office of Natural Heritage of the Department of Natural and Environmental Resources

Before performing the field survey, a review of available scientific literature consisting of studies about the Species to be search and the Project areas was made. Also, we consult the Critical, Vulnerable and Endangered Species Inventory of the USFWS and DNER. This inventory includes all species protected by Commonwealth and federal laws, in addition to other species whose populations are low or that are indicative of specific habitats in the Commonwealth of Puerto Rico. This information was field-validated by means of visits made to different areas of the project by our team of scientists. Also, USFWS recommendations on their letter from May 29, 2007 were incorporated on this document.

6.2 Reconnaissance Visits

Several reconnaissance visits were made to get acquainted with the different areas of the proposed project and to identify the property limits. These visits were also useful to validate information compiled from diverse documents and maps (topographical, soils, land use, wetlands, etc.) created by CSA's Geographic Information Systems Department (GIS). Based on those field visits a work plan for field work was designed.

6.3 Field Work: Search for Endangered Species

Special searches were made for species designated as critical, threatened or endangered (under Commonwealth and federal jurisdiction) reported for the areas near the proposed Project or with a high probability of being found on the site. These are one (1) bird species: the Puerto Rican Nightjar and four (4) plants, Vahl's boxwood (*Buxus vahlii*) and Bariaco (*Trichilia triacantha*), Woodbury's stopper (*Eugenia woodburyana*) and Puerto Rican manjack (*Cordia rupicola*).

Field work to determine the presence of endangered flora was performed in the Project area from July 18, August 21 to 23 and September 7, 2007. The endangered species documentation was analyzed into the study areas for the pipeline section from mile 2.98 to the end of mile 7.88 at the mountainous area from Peñuelas and Ponce.

Two teams of CSA biologist were at the field to perform the study. The Project right-of-way areas (60 feet both sides of the central land surveying alignment) were traversed intensively in their totality, without having to use of transects methodology. The areas were systematically and exhaustively traversed to cover the totality of the proposed site.

All areas where Endangered species were found, were identified on a satellite image using global positioning systems (GPS).

Puerto Rican Nightjar surveys were conducted between February 19 and 26, 2007 between miles 2.98 and 7.98 by trained wildlife biologists lead by Jose A. Salguero-Faría. During each date two teams conducted diurnal (0500 – 0800 hours) and nocturnal (1700 – 2000 hours) surveys. Each team surveyed a different point simultaneously. Each observation point surveyed for the nightjar survey covered an approximate area of 31,400 m² (100 meters radius). For example Team A surveyed point OP1 while Team B did so in point OP2. In total, six observation points (OP1, OP2, OP3, OP4, OP5 and OP8) were surveyed twice each. The location of the observation points is shown in Appendix 10.3. Teams recorded contact time and approximate location of individuals seen or heard during each survey. Additional field visits were done on October 18, 2006, July 18, August 21 and September 7 of 2007. Results are presented in Table 5.

The data was pooled and an average was calculated for number of contacts per observation point. This average was then used to calculate the approximate number of nightjars along the study area. This number is biased as for the most part only calling males were detected.

- Species were identified in the field, and photographs were taken during field visits for documentation. Identification of plants and animals was verified by means of reference books and field guides, such as Little, Woodbury and Wadsworth (1974), Liogier (1985; 1988; 1991; 1995; 1997), Raffaele et al.(1998), Wunderle (1994) and Little and Wadsworth (1999).

7.0 RESULTS

During this study the CSA team was able to locate fourteen plant and two faunal species considered as critical elements by the Department of Natural and Environmental Resources (DNER) at the Project right-of-way and vicinities. The concern plant species documented in this study are Hollywood lignum vitae (*Guaiacum sanctum*), cachimbo peludo (*Rondeletia pilosa*), black torch (*Erithalis fruticosa*), juso (*Rocheportia acanthopora*), Vahl's boxwood (*Buxus vahlii*), *Chamaesyce cowelli*, red anneslia (*Caliandra haematomma*), *Chamaecrista glandulosa*, Bariaco (*Trichilia triacantha*), *Polygala penaea*, break hill (*Sideroxylon obovatum*), *Eugenia woodburyana*, *Passiflora murucuja* and *Cissus obovata*. Among these plant species, three are classified by USFWS as endangered Bariaco, Woodbury's stopper and Vahl's boxwood. The endangered Puerto Rican Nightjar (*Caprimulgus noctitherus*) and the data-deficient blue-tailed siguana (*Ameiva wetmorei*) were the two faunal species considered as endangered and critical species, respectively, by the DNER.

Hollywood lignum vitae were found throughout the project area, especially along the upper ridges. Juso (*Rocheportia acanthopora*) was found throughout the study area, being rather common along the edges of forested areas. Vahl's boxwood was found at the hills section north of mile 2 of the Project and also at the end of mile 5 at the Project right-of way. The section near mile 5.6 contained several concern species such, *Caliandra haematomma*, *Rondeletia pilosa*, *Chamaesyce cowelli*, *Erithalis fruticosa* and *Chamaecrista glandulosa* as expected in the open limestone soils found there. Bariaco was observed at the area north of Las Cucharas penitentiary near mile 4.5 of the Project. *Polygala penaea* was found all over at the top ridges of the hills at the Project right-of-way. Break hill (*Sideroxylon obovatum*) was observed at different points through all the alignment extension and may be considered as common in semi-open areas. *Cissus obovata* was found near the intermittent creek that crosses mile 5.

The Proposed Project area between mile 2.98 and 7.88 is considered as habitat for the endangered species Puerto Rican Nightjar, Bariaco and Vahl's boxwood. As in the previous flora and fauna study field visits, the results were positive for the presence of the Puerto Rican Nightjar, Bariaco and Vahl's boxwood in the Project right-of-way.

Endangered Flora:

Two (2) endangered flora species were found at the right-of-way of the Proposed Project during the field study. Almost all the individual were found on forested areas described as semi-deciduous dry forest. At this area it is common to find bigger trees with a more dense forest cover than in the other habitats described above as more mesic conditions prevail. A total of three (3) individuals of Bariaco (*Trichilia triacantha*) and 378 individuals of Vahl's boxwood (*Buxus vahlii*) were counted in the Proposed Project right-of-way. Table 3 and Appendix 10.3 present the results of the endangered flora inventory.

It is possible that those species could be found out of the right-of-way due to the conditions of the habitat at the area.

Table 3: Endangered Flora Species, location and amount observed at the Proposed Project right-of-way.

Species (Map ID)	Amount	Latitude	Longitude	Observations
<i>Buxus vahlii</i> (Bv1)	16	17°59'07.16"	66°40'32.14"	Search west side of land survey line. Healthy individuals, DBH 1-3" Height 5-10'
<i>Buxus vahlii</i> (Bv2)	35	17°59'07.88"	66°40'32.17"	Search west side of land survey line. Healthy individuals, DBH 1-3" Height 5-10'
<i>Buxus vahlii</i> (Bv3)	3	17°59'08.06"	66°40'32.14"	Search west side of land survey line. Healthy individuals, DBH 1-3" Height 5-10' Felled tree in middle of land survey line. Some individuals with flowers
<i>Buxus vahlii</i> (Bv4)	2	17°59'10.00"	66°40'32.18"	Search west side of land survey line. Healthy individuals, DBH 1-3" Height 5-10'
<i>Buxus vahlii</i> (Bv5)	10	17°59'08.20"	66°40'32.20"	Search west side of land survey line. Healthy individuals, DBH 1-3" Height 5-10'
<i>Buxus vahlii</i> (Bv6)	13	17°59'13.36"	66°40'32.21"	Search west side of land survey line. Healthy individuals, DBH 1-3" Height 5-12' Adult trees without inflorescences
<i>Buxus vahlii</i> (Bv7)	26	17°59'06.77"	66°40'32.14"	Search west side of land survey line. Healthy individuals, DBH 1-3" Height 5-8' located between <i>Thrinax morrissii</i> palms.
<i>Buxus vahlii</i> (Bv8)	61	17°59' 09.11"	66°40' 31.77"	Search east side of land survey line.
<i>Buxus vahlii</i> (Bv9)	208	17°59' 13.61"	66°40' 31.65"	Search east side of land survey line.
<i>Trichilia triacantha</i> (Tt1)	3	18°00'03.07"	66°42'59.10"	Three (3) individuals with multiple trunks at the north slope of the hill at mile 2.5 approximately, one of

Species (Map ID)	Amount	Latitude	Longitude	Observations
				them cut by land surveying works at the middle of the right-of-way
<i>Trichilia triacantha</i> (Tt2)	21 alive/ 5 dead	17°59'42.03"	66°41'27.26"	Those individuals were out of action area but inside a 400 meters buffer area. Individuals were below power lines and 5 of them were cut by tree clearing crew and died. All individuals are healthy between 5 to 10 feet of height.
<i>Eugenia woodburyana</i> (Ew1)	1	17°59'42.04	66°41'26.56"	A solitary individual was observed in the area, about 4 feet height, in poor condition, previously cut.

Endangered Fauna:

The Puerto Rican Nightjar was detected at the Proposed Project right-of-way on several visits to the Proposed Project area (See Table 4: Puerto Rican Nightjar survey locations). As result of the field survey from February 19 to 23 and February 26, 2007 one (1) to nine (9) nightjars were detected on morning and nocturnal visits. Also, some additional sightings were obtained during the search of endangered flora at the area. At observation point OP1 a single male was heard calling on October 18, 2006 in this location; OP4, one (1) male was heard calling on September 7, 2007 at 1000 hours during endangered tree inventory at the area; OP6, a male was observed perched on *Buxus vahlii* on August 21, 2007 at 1400 hours; OP7 a single nightjar was heard during field visit on early morning on August 21, 2007; OP9, three (3) nightjars were detected on July 18, 2007 field visit between 0815 and 0900 hours. The Puerto Rican Nightjar was heard and seen during all field visits (diurnal and nocturnal visits) through the area, except the observation point (OP10) that is very impacted and open.

Approximately 77.09 acres (311,990.82 m²) of PRNI habitat will be impacted by the Proposed Action at the municipalities of Peñuelas and Ponce. See Appendix 10.3 to see Satellite Image with observation point locations.

A total of 55 male nightjars were detected during morning and evening surveys for an average of 4.58 birds per observation point (100 meters radius). The total area of the study area is approximately 311,990 m², therefore it is estimated that 45.5 male nightjars have territories within the vicinity of the Project area.

Detailed observations of the Puerto Rican Nightjar at the different coordinates at the GDS location are presented on table 4 and 5.

Table 4: Puerto Rican Nightjar (*Caprimulgus noctitherus*) survey stations locations.

Survey Stations (ID)	Coordinates		Presence (heard or seen)
	Latitude	Longitude	
OP1	18° 00 03.36"	66° 43' 07.47"	Yes
OP2	17° 59 59.23"	66° 42' 37.35"	Yes
OP3	17° 59 56.16"	66° 42' 07.09"	Yes
OP4	17° 59 48.58"	66° 41' 28.19"	Yes
OP5	17° 59 37.62"	66° 40' 45.09"	Yes
OP6	17° 59 08.21"	66° 40' 32.22"	Yes
OP7	17° 59 04.66"	66° 40' 32.18"	Yes
OP8	17° 58 53.91"	66° 40' 32.45"	Yes
OP9	17° 58 51.33"	66° 40' 20.02"	Yes
OP10	17° 58 46.29"	66° 40' 00.51"	No

Table 5: Results of sightings of Puerto Rican Nightjar (*Caprimulgus noctitherus*) during field survey from February 19 to 23 and February 26, 2007.

Survey Date	Observation Point	Observations
February 19, 2007	OP1	Morning- three (3) males were heard. Evening - two (2) males were heard.
	OP2	Morning - two (2) males were heard. Evening - one (1) male was heard.
February 20, 2007	OP3	Morning - one (1) male was heard. Evening - one (1) male was heard.
	OP4	Morning - one (1) male was heard Evening - one (1) male was heard.

Survey Date	Observation Point	Observations
February 21, 2007	OP5	Morning - three (3) males were heard. Evening - five (5) males were heard.
	OP8	Morning - two (2) males were heard. Evening - nine (9) nightjars detected, 7 males heard and two females observed along trail.
February 22, 2007	OP1	Morning - three (3) males were heard. Evening - two (2) males were heard.
	OP2	Morning - one (1) male was heard. Evening - one (1) male was heard
February 23, 2007	OP3	Morning - one (1) male was heard. Evening - one (1) male was heard.
	OP4	Morning - one (1) male was heard Evening - one (1) male was heard.
February 26, 2007	OP5	Morning - two (2) males were heard. Evening - five (5) males were heard.
	OP8	Morning - two (2) males were heard. Evening - six (6) males heard.

8.0 CONCLUSIONS AND RECOMENDATIONS

The Proposed Project "Gasoducto del Sur" will affect ecologically sensitive areas and endangered flora and fauna species at the municipalities of Peñuelas and Ponce. Those areas contain endangered species protected by the Commonwealth and Federal laws. Due to the nature of the Proposed Project there are some impacts that could not be prevented, for this reason it is recommended to fulfill protective measures to minimize those impacts. The following are the most critical findings and recommendations of the study which require preventive and mitigation measures:

- Three endangered species were observed at the Proposed Project right-of-way, Bariaco, Vahl's boxwood and the Puerto Rican Nightjar. Actually, the route has been modified to avoid any impact to the endangered species at the area.
- There would be temporary and permanent impacts on the endangered terrestrial flora and fauna during the construction period of the Project. A total of 77.09 acres (120 feet right-of-way throughout 5.3 miles) will be impacted by the Proposed Project. According to the Field work three (3) individuals of Bariaco and 408 individuals of Vahl's boxwood would be impacted by the actual route right-of-way at the municipalities of Peñuelas and Ponce. Actually, the route has been modified to avoid any impacts to the endangered species found at the Propose Project Area.
- The land survey activities for the GDS already affected individuals of Vahl's boxwood and Bariaco at the right-of-way of the GDS. It is necessary to measure the actual damage to be contemplated in the mitigation and management plans for those species. The GDS will need to implement mitigation and conservation management plans for those affected species, Bariaco, Vahl's boxwood and Puerto Rican Nightjar.
- It is necessary to have an expert (Field Biologist) during the construction period to identify those endangered species in the Peñuelas – Ponce Area, which is the location where threatened and endangered species were observed and documented. The Field biologist will train the personnel working on the project to recognize the endangered flora and fauna, and instruct them on the importance and legal status of those species.

- Any removal or clearing of natural habitat should be made in compliance with the New Law of Puerto Rico Wildlife (known as, Nueva Ley de Vida Silvestre de Puerto Rico, Ley Núm. 241 del 15 de agosto de 1999). Any vegetation removal on sensitive areas needs to be performed out of the breeding season of the PRN. This should be done in coordination with the DNER and USFWS.
- Due to the characteristic of the soil on that area, transplanting those individuals is not feasible. It is also recommended that a propagation plan of endangered plants species be established to increase the local population at the vicinities of the Project.
- For the Puerto Rican Nightjar, the Bariaco and Vahl's boxwood, it is important to realize inspections at the area previous to any land movement. For the PRN, those inspections need to be done at different times of the year and especially during the reproductive season (February to August). Any activities of the species need to be documented. This reports need to be submitted to the related agencies, as the USFWS and DNER. Is important to maintain a record of the activities in the area before any construction activities.
- It is possible that those endangered species found on the GDS right-of-way will be also on the vicinities of the Project. For this reason, it is important to minimize the generation of garbage at the Project area and vicinities. Also, it is important to maintain all material storage out of the construction areas especially if these are identified as ecologically sensitive.
- At pre-construction, the Contractor shall present his proposed plans and schedules for protection of the ecologically sensitive areas and minimize impacts, in accordance with the requirements of this section and the construction plans.
- Placing temporary barriers to delineate the area that will be developed and minimizing contact between the construction work and adjacent biological resources should be considered as protection measures.
- New lands that fulfill those habitat characteristics important for the endangered species that could be affected by the Project should be acquired. The acquisition and conservation of adjacent land, where similar ecosystems are found, is recommended and is likely to increase the chances that the species will remain as a viable population in the area.

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